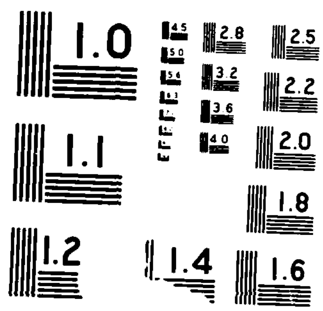
AD-A193 106 INSTALLATION RESTORATION PROGRAM PHASE 2 CONFIRMATION/QUANTIFICATION STAGE 2(U) DAMES AND MOORE PARK RIDGE IL 03 APR 88 F33615-83-D-4002 1/4

UNCLASSIFIED F/G 24/4 NL


1.0
1.1
1.2
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 2

EIELSON AIR FORCE BASE, ALASKA

DAMES & MOORE
1550 NORTHWEST HIGHWAY
PARK RIDGE, ILLINOIS 60068

APRIL 3, 1988

FINAL REPORT (15 JULY 1986 TO 7 JULY 1987)

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

PREPARED FOR
ALASKAN AIR COMMAND
ELMENDORF AFB, ALASKA 99506

UNITED STATES AIR FORCE
OCCUPATIONAL & ENVIRONMENTAL HEALTH LABORATORY (USAFOEHL)
TECHNICAL SERVICES DIVISION (TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 2

FINAL REPORT

FOR

EIELSON AIR FORCE BASE
ALASKA

ALASKAN AIR COMMAND
ELMENDORF AFB, ALASKA 99506

APRIL 3, 1988

PREPARED BY

DAMES & MOORE
1550 NORTHWEST HIGHWAY
PARK RIDGE, ILLINOIS 60068

USAF CONTRACT NO. F33615-83-D-4002, DELIVERY ORDER NO. 0037

USAFOEHL TECHNICAL MONITOR

RICHARD C. CARMICHAEL, MAJ, USAF, BSC
TECHNICAL SERVICES DIVISION

USAF OCCUPATIONAL & ENVIRONMENTAL HEALTH LABORATORY (USAFOEHL)
TECHNICAL SERVICES DIVISION (TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

NOTICE

This report has been prepared for the United States Air Force by Dames & Moore, for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

Copies of this report may be purchased from:

National Technical Information Services
5285 Port Royal Road
Springfield, Virginia 22161

Federal Government agencies and their contractors registered with Defense Technical Information Center should direct requests for copies of this report to:

Defense Technical Information Center
Cameron Station
Alexandria, Virginia 22314

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS None
2a SECURITY CLASSIFICATION AUTHORITY Not applicable	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b DECLASSIFICATION/DOWNGRADING SCHEDULE Not applicable	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) Not applicable	5 MONITORING ORGANIZATION REPORT NUMBER(S) Not applicable
6a NAME OF PERFORMING ORGANIZATION Dames & Moore 6b OFFICE SYMBOL *(If applicable)*	7a NAME OF MONITORING ORGANIZATION U.S. Air Force Occupational and Environmental Health Laboratory/TS
6c ADDRESS *(City, State, and ZIP Code)* 1550 Northwest Highway Park Ridge, IL 60068	7b ADDRESS *(City, State, and ZIP Code)* Brooks Air Force Base San Antonio, TX 78235-5501
8a NAME OF FUNDING/SPONSORING ORGANIZATION USAHOEHL 8b OFFICE SYMBOL *(If applicable)*	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F33615-83-D4002/0037
8c ADDRESS *(City, State, and ZIP Code)* Brooks Air Force Base San Antonio, TX 78235-5501	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO | PROJECT NO | TASK NO | WORK UNIT ACCESSION NO

11 TITLE *(Include Security Classification)*

IRP Phase II, Stage 2, Final Report, Eielson Air Force Base, Alaska

12 PERSONAL AUTHOR(S)
Dames & Moore

13a TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT *(Year, Month, Day)*	15 PAGE COUNT
Final	FROM 7/86 TO 7/87	88 April 3	345

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS *(Continue on reverse if necessary and identify by block number)*
FIELD	GROUP	SUB-GROUP	

19 ABSTRACT *(Continue on reverse if necessary and identify by block number)*

Three sites were investigated at Eielson AFB during the Phase II, Stage 2 field evaluation of the IRP. The sites were the sewage treatment plant spill ponds and treated effluent leaching ponds (Site 32) and two base landfills (Sites 2 and 1). A geophysical survey was performed in the vicinity of the sludge treatment plant to help define areas of high electromagnetic conductivity (i.e., potential contamination) and aid in the placement of monitor wells. Eight monitor wells were installed during Stage 2. Ground water samples from Stage 1 and Stage 2 wells were analyzed for purgeable halocarbons, purgeable aromatics, petroleum hydrocarbons, TDS, TOC, total phosphates, nitrate, nitrite, pesticides, lead, arsenic, cadmium, chromium, mercury and silver. Soil samples from the vicinity of one of the landfills (Site 1) were tested for the presence of pesticides.

Trace quantities of purgeable halocarbons and petroleum hydrocarbons were detected in the wells from all three sites. Drinking water standards for total trihalomethanes were not exceeded for any of these samples. Arsenic and cadmium were detected in wells at concentrations were elevated in the vicinity of the sewage treatment plant. Only one well, in close proximity to the sewage sludge drying beds, was found to have nitrate, nitrite concentrations above the Primary Drinking Water Standard. A well downgradient from this site had nitrate, nitrite levels below the same standard.

Soils at Site 1 contain trace quantities of DDE, DDD, and DDT. No pesticides were detected in groundwater from the monitor well at this site.

Natural groundwater at Eielson AFB is of good quality and can be obtained in good quantities from the sand and gravel water table aquifer.

The results of this study suggest that the contaminants discovered do not currently pose a significant threat to human health.

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION Unclassified
22a NAME OF RESPONSIBLE INDIVIDUAL Maj Richard Carmichael	22b TELEPHONE *(Include Area Code)* 800/821-4528 | 22c OFFICE SYMBOL USAFOEHL/TS

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

PREFACE

As part of the U.S. Air Force Installation Restoration Program (IRP), investigations were undertaken at three sites on Eielson Air Force Base, Alaska, to determine whether hazardous material contamination is present. This report, prepared by Dames & Moore under Contract No. F33615-83-D-4002, Order No. 0037, presents the results of the Phase II, Stage 2, IRP investigations. The period of work reported on herein was 15 July 1986 through 7 July 1987. The field investigations were directed by Mr. Michael W. Ander and supervised by Mr. Jon Michael Stanley. Well installation and sampling were supervised by Ms. Amy Lamborg and Ms. Kay Tauscher. The geophysical survey was conducted by Mr. Thomas S. Jensen. Additional assistance in data compilation and analysis, report preparation, and administrative management was provided by Ms. Carol J. Scholl and Ms. Beverly Harper. Drilling was subcontracted to Tester Drilling Services, Inc., Anchorage, Alaska; chemical analyses to UBTL, Inc., of Salt Lake City, Utah; and surveying to Kean and Associates, Anchorage, Alaska. Maj. Richard Carmichael, Technical Services Division, USAF Occupation and Environmental Health Laboratory (OEHL), was the Technical Monitor.

Approved:

Glenn D. Martin

Glenn D. Martin
Contract Program Manager

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

SUMMARY

Eielson Air Force Base (AFB) is located at Mile 26 of the Richardson Highway, approximately 23 miles southeast of Fairbanks, Alaska. It is located on the floodplain of the Tanana River and is underlain by 200 to 300 feet of unconsolidated sediments, primarily sand and gravel. The base has been in operation since 1944, and its host organization is the 343rd Composite Wing of the Alaskan Air Command.

The Phase II field evaluation of the Installation Restoration Program (IRP) consisted of investigations at the following 3 sites:

- Site 32: Sewage Treatment Plant Spill Ponds and Treated Effluent Leaching Ponds
- Site 2: Old Base Landfill (1960 to 1967)
- Site 1: Original Base Landfill (1950 to 1960)

The field investigations consisted of the following activities:

- Performance of electromagnetic (EM) surveys downgradient of Site 32 to determine the areal extent of any contaminant plumes;
- Drilling, soil sampling, and geologic logging of twelve borings distributed among Sites 32, 2, and 1;
- Installation of monitor wells in eight of the twelve borings;
- Performance of a slug test in an upgradient well at Site 32 to determine the hydraulic conductivity of the surficial aquifer; and
- Analysis of soil samples from four of the borings at Site 1 for pesticides and moisture content, and selected ground water samples from the remaining eight new monitor wells and four existing wells (drilled during Phase II, Stage 1) for petroleum hydrocarbons, purgeable halocarbons, purgeable aromatics, pesticides, nitrate, nitrite, lead, arsenic, cadmium, chromium, mercury, silver, total dissolved solids (TDS), total phosphate, and total organic carbon (TOC).

Ground water is available from a shallow water table aquifer under Eielson AFB. The water level is approximately 5 to 10 feet below the ground surface and slopes very gradually to the north-northwest. The aquifer is approximately 250 feet thick and likely extends through the unconsolidated material to the Birch Creek Schist. Water quality is good except for high iron in some wells. The aquifer is limited in areal extent to the broad valley of the Tanana River Basin; at Eielson AFB, this valley is approximately 45 to 50 miles wide.

The following tables summarize the ground water and soil analyses from the Stage 2 effort.

ANALYTICAL RESULTS ABOVE DETECTION LIMITS
WATER SAMPLES
EIELSON AFB
IRP PHASE II STAGE 2

PARAMETER	UNIT	DETECTION LIMIT	PRIMARY DRINKING WATER STANDARD	SECONDARY DRINKING WATER STANDARD	SITE 2 GW-2B	GW-2C	W-8	W-9	TRIP BLANK TWO (W-8)	W-9(FOC) TWO	SITE 1 TRIP BLANK 09/15/86[c]	W-10
Trichlorofluoromethane	ug/L	0.44	N.E.[b]	N.E.	1.2	5.4	5.6	3.4	N.A.	N.A.	N.D.	3.0
Petroleum Hydrocarbons	mg/L	0.2	N.E.	N.E.	1.6	1.6	N.D.	1.8	N.A.	N.A.	1.4[d]	N.D.[e]
TDS	mg/L	10.	N.E.	500	170[e]	200[e]	200[e]	240[e]	14[e]	12[e]	N.D.	180[e]
Arsenic	mg/L	0.001	0.05	N.E.	8	5.	24.	9.	N.A.	N.A.	N.D.	N.A.
Cadmium	mg/L	0.004	0.010	N.E.	N.D.	9.	N.D.	4.	N.A.	N.A.	N.D.	N.A.
Temperature	°C	0.1	N.E.	N.E.	1.1	4.0	2.3	3.5	N.A.	N.A.	N.D.	6.8
pH	S.U.	0.1	N.E.	6.5-8.5	6.4	6.8	6.4	6.4	N.A.	N.A.	N.D.	7.6
Specific Conductivity	umhos/cm	10	N.E.	N.E.	221	167	357	341	N.A.	N.A.	N.D.	216

[a] A second column confirmation was performed
[b] Total Trihalomethanes = 100 ug/L
[c] Date received by UBTL
[d] Attributed to laboratory background
[e] Sampled July, 1987
N.A. = Not analyzed for this parameter
N.E. = No criterion established
N.D. = None detected

ANALYTICAL RESULTS ABOVE DETECTION LIMITS
WATER SAMPLES
EIELSON AFB
IRP PHASE II STAGE 2

PARAMETER	UNIT	DETECTION LIMIT	PRIMARY DRINKING WATER STANDARD	SECONDARY DRINKING WATER STANDARD	SITE 32 GW-32A	GW-32B	GW-32B(FQC) 32	GW-32C	FIELD QC (GW-32C)	GW-32C(FQC) 32	GW-32D	GW-32E	GW-32F	W-7	TRIP BLANK 09/16/86[c]	TRIP PLAIN 32 (GW32A)
1,1-Dichloroethane[a]	ug/L	0.49	N.E.	N.E.	N.D.	N.D.	N.A.	2.0	1.8	N.A.	0.74	0.63	N.D.	N.D.	N.D.	N.A.
trans-1,2-Dichloroethene	ug/L	0.42	N.E.	N.E.	N.D.	N.D.	N.A.	2.4	2.5	N.A.	N.D.	N.D.	N.D.	N.D.	N.D.	N.A.
Trichlorofluoromethane	ug/L	0.44	N.E.[b]	N.E.	21.	2.9	N.A.	9.0	4.4	N.A.	6.1	4.6	11.	8.7	N.D.	N.A.
Petroleum Hydrocarbons	mg/L	0.2	N.E.	N.E.	N.D.[e]	0.4[e]	0.2[e]	0.3[e]	0.6	N.A.	0.3[e]	N.D.	N.D.[e]	N.D.	0.5[d]	N.D.[e]
TDS	mg/L	10.	N.E.	500	210[e]	200[e]	N.A.	460[e]	480	470[e]	290[e]	320[e]	240[e]	330[e]	38[d]	N.A.
TOC	mg/L	1.	N.E.	N.E.	33.	110	N.A.	57.	75.	N.A.	26.	34.	19.	7.	N.D.	N.A.
Total Phosphate	mg/L	0.1	N.E.	N.E.	8.1	5.5	N.A.	4.5	4.7	N.A.	3.6	4.3	4.7	0.3	N.D.	N.A.
Nitrate, Nitrite	mg/L	0.01	10	N.E.	0.16	0.15	N.A.	0.22	0.50	N.A.	0.12	0.13	0.11	24.	N.A.	N.A.
Lead	mg/L	0.005	0.05	N.E.	0.006	N.D.	N.A.	N.D.	0.005	N.A.	N.D.	N.D.	N.D.	N.D.	N.D.	N.A.
Temperature	°C	0.1	N.E.	N.E.	5.2	5.2	N.A.	9.2	9.2	N.A.	4.2	4.0	6.2	7.5	N.D.	N.A.
pH	S.U.	0.1	N.E.	6.5-8.5	6.1	6.1	N.A.	6.5	6.5	N.A.	7.4	7.7	6.4	5.9	N.D.	N.A.
Specific conductivity	umhos/cm	10	N.E.	N.E.	320	383	N.A.	687	687	N.A.	589	606	371	539	N.D.	N.A.

a A second column confirmation was performed
b Total trihalomethanes = 100 ug/L
c Date received by UBTL
d Attributed to laboratory background
e Sampled July, 1987
N.A.= Not analyzed for this parameter
N.E.= No criteria established
N.D.= None detected

The following table summarizes the analyses for pesticides on Site 1 soils.

ANALYTICAL RESULTS ABOVE DETECTION LIMITS*
SOIL SAMPLES - SITE 1
EIELSON AFB
IRP PHASE II STAGE 2

	Moisture (%)	4,4'-DDD (mg/kg)	4,4'-DDE (mg/kg)	4,4'-DDT (mg/kg)
DETECTION LIMIT	1.0	0.0002	0.0005	0.0005
Sample designation with depth in feet				
B1-A 0-1.5	6.9	0.002	0.004	0.008
B1-B 0-1.5	9.0	N.D.	0.003	0.005
B1-B 2.5-4	8.0	N.D.	0.001	0.001
B1-B 2.5-4 (duplicate)	8.7	N.D.	N.D.	0.003
B1-B 5-6.5	9.7	N.D.	0.002	0.002
B1-B 7.5-9	24.	N.D.	N.D.	0.004
B1-B 7.5-9 (duplicate)	14.	N.D.	0.001	0.002
B1-C 0-1.5	5.9	0.003	0.001	0.002
B1-C 5-6.5	4.6	N.D.	N.D.	0.001
B1-C 7.5-9	17.	N.D.	0.001	0.005
B1-D 0-1.5	9.7	N.D.	N.D.	0.003
B1-D 2.5-4	5.6	N.D.	N.D.	0.001

*Concentrations are on a dry weight basis.

N.D. = None detected.

The results of the Phase II, Stage 2 investigation confirm the conclusions of the Stage 1 study regarding the existence of ground water contamination at Sites 32 and 2 and soil contamination at Site 1. However, the levels of contamination are generally low and the location of the contaminants within the ground water regime does not appear to be immediately threatening to on-base or off-base potable wells.

The results of the Stage 2 investigations suggest that pesticides are not leached out of the soils at Site 1 in sufficient concentrations to be detected in the ground water. Therefore, the ground water monitoring program should not include further pesticide analysis.

The concentrations of lead found at Site 2 are below the Primary Drinking Water Standard (PDWS) and are not considered significant. The nutrients phosphate and nitrate,nitrite result from incomplete waste water treatment at the Site 32 sewage treatment plant. The presence of these parameters is assumed to be a local condition with minimal potential health hazard.

Low concentrations of 1,1-dichloroethane and/or trans-1,2-dichloroethane were found in only three Site 32 wells. Additional monitoring for these parameters does not appear warranted.

Contaminants of concern recommended for further monitoring are petroleum hydrocarbons, arsenic and cadmium. A ground water monitoring program should be designed that would include petroleum hydrocarbons and TDS from the Sites 32, 2, and 1 monitor wells. The source of the concentrations of arsenic and cadmium at Site 2 is unknown. These metals, which exceeded the PDWS, should be analyzed in water samples collected from the Stage 2 monitor wells. The presence of trichlorofluoromethane remains in question and should be part of the resampling effort to determine its source. The possibility exists that this parameter may be the result of laboratory or trip contamination.

It is recommended that an additional four monitor wells be installed downgradient and north of Site 32 at the base boundary to monitor the potential for migration of contaminants off-base.

It is also recommended that a monitoring program be conducted at selected Stage 2 wells and the newly-proposed base boundary wells to provide data regarding the potential for off-base migration toward the

community of Moose Creek, the attenuation characteristics of the water table aquifer, and the impacts to ground water chemistry generated by the remedial activities in the fuel saturated area.

The following summarized our recommendations and rationale:

Site	Recommended Action	Rationale
General, Sites 32, 2, and 1	Resample all Stage 2 wells and analyze for trichlorofluoromethane (USEPA Method 601).	Analysis and source are in question.
	Resample and analyze all Stage 2 wells for cadmium (USEPA Method 206.2) and arsenic (USEPA Method 200.7).	To confirm presence at Site 2 and determine ambient base levels for these metals.
32	Install four wells downgradient of Site 32 along base boundary. Analyze ground water for petroleum hydrocarbons, arsenic, cadmium, pH, temperature, and conductivity.	To characterize ground water quality for parameters of concern before ground water leaves base perimeter.
32	Redo slug test on upgradient well and couple this test with a rising head test.	To better define the hydraulic conductivity of the near-surface portion of the aquifer.
General	Institute a program of ground water monitoring on selected Stage 2 wells (W-10, W-9, W-8, GW-2B, GW-2C, W-7, and GW-32B) and four base perimeter wells and analyze for petroleum hydrocarbons, and arsenic and cadmium <u>if</u> these parameters exceed PDWS during the next sampling effort.	To monitor ground water quality as to impact from remediation efforts at fuel saturated area and to document ground water quality changes with time.

I. INTRODUCTION

A. BACKGROUND

The Department of Defense (DOD) initiated the Installation Restoration Program (IRP) to investigate and mitigate any environmental contamination that may be present at DOD facilities as a result of handling or disposing of hazardous materials. The IRP was issued as Defense Environmental Quality Program Policy Memorandum (DEOPPM) 81-5 in 1981. The U.S. Air Force (USAF) implemented DEQPPM 81-5 in 1982 as a four-phased program:

Phase I	Program Identification/Records Search
Phase II	Program Confirmation and Quantification
	- Several stages as necessary
Phase III	Technology Base Development
Phase IV	Corrective Action

The Phase I study at Eielson Air Force Base (AFB), Fairbanks, Alaska, was completed by CH2M Hill (1982). Dames & Moore was retained by the USAF under Contract Number F33615-83-D-4002, Order 0020, to conduct the Phase II, Stage 1, field evaluation, which was completed in March 1986 (Dames & Moore, 1986). In July 1986, under the same contract, Order 0037, Dames & Moore was again retained to conduct the Phase II, Stage 2, field evaluation.

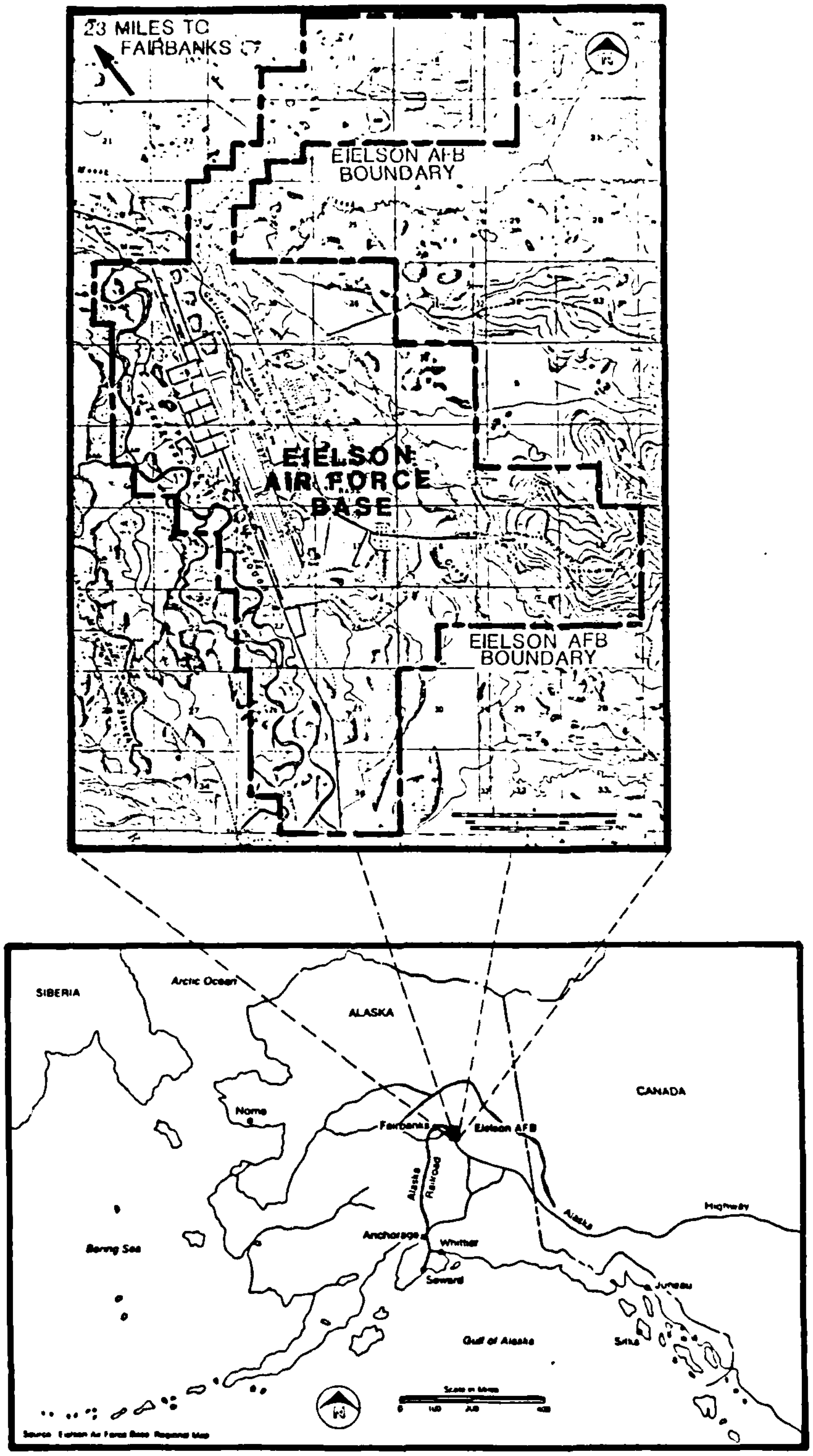
The location of Eielson AFB is provided on the Vicinity Map, Plate 1. This report presents the results of Dames & Moore's Phase II, Stage 2 field and laboratory investigations in the vicinity of selected waste disposal and handling areas of Eielson AFB. Chemical analyses were performed by UBTL, Inc., of Salt Lake City, Utah, as subcontractor to Dames & Moore. Drilling services were provided by Tester Drilling Services, Inc., and surveying by Kean and Associates, both of Anchorage, Alaska.

B. PURPOSE AND SCOPE

The purposes of the field evaluation portion of Phase II, Stage 2, of the IRP were to:

1. Confirm the presence of suspected contamination within the specified areas of investigation;

2. Determine the magnitude of contamination and the potential for migration of those contaminants in various environmental media;



VICINITY MAP
EIELSON AIR FORCE BASE, ALASKA

SOURCE: CH2M HILL (1982)

Dames & Moore

PLATE 1

3. Identify public health and environmental hazards of migrating pollutants based on State or Federal Standards for those contaminants; and

4. Delineate additional investigations required beyond this stage to reach the Phase II objectives.

The scope of work as outlined for Phase II, Stage 2, of the IRP consisted of the following activities:

1. Performance of electromagnetic (EM) surveys downgradient of Site 32 to determine the areal extent of any contaminant plumes;

2. Drilling, soil sampling, and geologic logging of twelve borings distributed among Sites 32, 2, and 1 on Eielson AFB;

3. Installation of monitor wells in eight of the twelve borings;

4. Performance of a slug test in an upgradient well at Site 32 to determine the hydraulic conductivity of the surficial aquifer;

5. Analysis of soil samples from four of the borings at Site 1 for pesticides and moisture content, and selected ground water samples from the remaining eight new monitor wells and four existing wells (drilled during Phase II, Stage 1) for petroleum hydrocarbons, purgeable halocarbons, purgeable aromatics, pesticides, nitrate, nitrite, lead, arsenic, cadmium, chromium, mercury, silver, total dissolved solids (TDS), total phosphate, and total organic carbon (TOC); and

6. Preparation of this report which presents the findings.

Field work began on 13 August 1986 and continued, in several stages, through 07 July 1987.

C. HISTORY OF EIELSON AFB AND WASTE DISPOSAL OPERATIONS

Eielson AFB was originally a satellite installation of Ladd Field (now Fort Wainwright, a U.S. Army installation) and was known as Mile 26, as it is located at Mile 26 of the Richardson Highway. Initial construction commenced in 1943, and the original base was completed in 1944. The base

was constructed to handle lend-lease aircraft transfers to the USSR because Ladd Field's runway was too short for some of the aircraft and the volume of aircraft to be transferred overwhelmed the facilities there.

At the end of World War II, the field was deactivated, but it was reopened in 1946 as a future strategic base. The majority of the base facilities, including a larger, longer runway, were constructed in the period from 1947 to 1954. The base was officially named Eielson AFB in February 1948. During the 1950s, the base was used jointly by the USAF and the U.S. Army.

The host organization at Eielson AFB is the 343rd Composite Wing of the Alaskan Air Command (AAC), formerly the 5010th Combat Support Group.

Industrial wastes generated on Eielson AFB prior to 1950 were insignificant. From about 1950 to 1972, wastes generated at Eielson AFB were disposed of by road oiling, burning in fire department training exercises, disposal in on-base landfills, or discharge to the sanitary sewer. From 1972 to 1978, industrial wastes were used for road oiling, placed in the landfill, or transferred to the Defense Property Disposal Office (DPDO) located at Fort Wainwright for salvage. Some solvents and most aircraft cleaning compounds were discharged to the sanitary sewer. JP-4 fuel with less than 10 percent contaminants was mixed with clean JP-4 and burned in fire training exercises or salvaged by DPDO. Since 1978, all wastes have been disposed of by DPDO, except up to 5,000 gallons per year of waste oils for road oiling, JP-4 with less than 10 percent contaminants for fire training exercises, and aircraft cleaning compounds, which are discharged to the sanitary sewer (CH2M Hill, 1982).

D. DESCRIPTION OF SITES

CH2M Hill (1982) identified 43 sites within Eielson AFB where potentially hazardous materials were generated, disposed of, or used in some activity. Each site was rated during the Phase I study using the Hazard Assessment Rating Methodology (HARM) developed by JRB Associates, Inc. (1980). This rating procedure utilizes site characteristics, waste characteristics, the potential for contaminant migration, and waste management practices to identify sites warranting further investigation. Ranking scores of 17 of the sites were deemed sufficiently high to warrant field investigation. A scope of work was issued to Dames & Moore on 19 July 1984 under Contract F33615-83-D-4002, Order 0020, for Phase II, Stage 1, investigations, and on 15 July 1986, under Order 0037, as modified on 11 August 1986, for Phase II, Stage 2, investigations at the following sites:

- Site 32 Sewage Treatment Plant Spill Ponds and Treated Effluent Leaching Ponds
- Site 2: Old Base Landfill (1960 to 1967)
- Site 1: Original Base Landfill (1950 to 1960)

These sites are shown on Plate 2 and are described below.

1. Site 32: Sewage Treatment Plant Spill Ponds and Treated Effluent Leaching Ponds

Two unlined pits adjacent to the sewage treatment plant have been used intermittently since 1970 to contain wastes bypassed around the plant that could cause a plant upset. Spills, primarily petroleum, oils, and lubricants (POL) products, were diverted to the pits. In addition, an old gravel pit into which treated effluent is discharged year-round and from which effluent percolates into the soil was included in this investigation. The sewage treatment plant discharges some 15,000 gallons of effluent to this pond per day. Treatment includes digestion, aeration, and chlorination prior to discharge to the pond.

2. Site 2: Old Base Landfill (1960-1967)

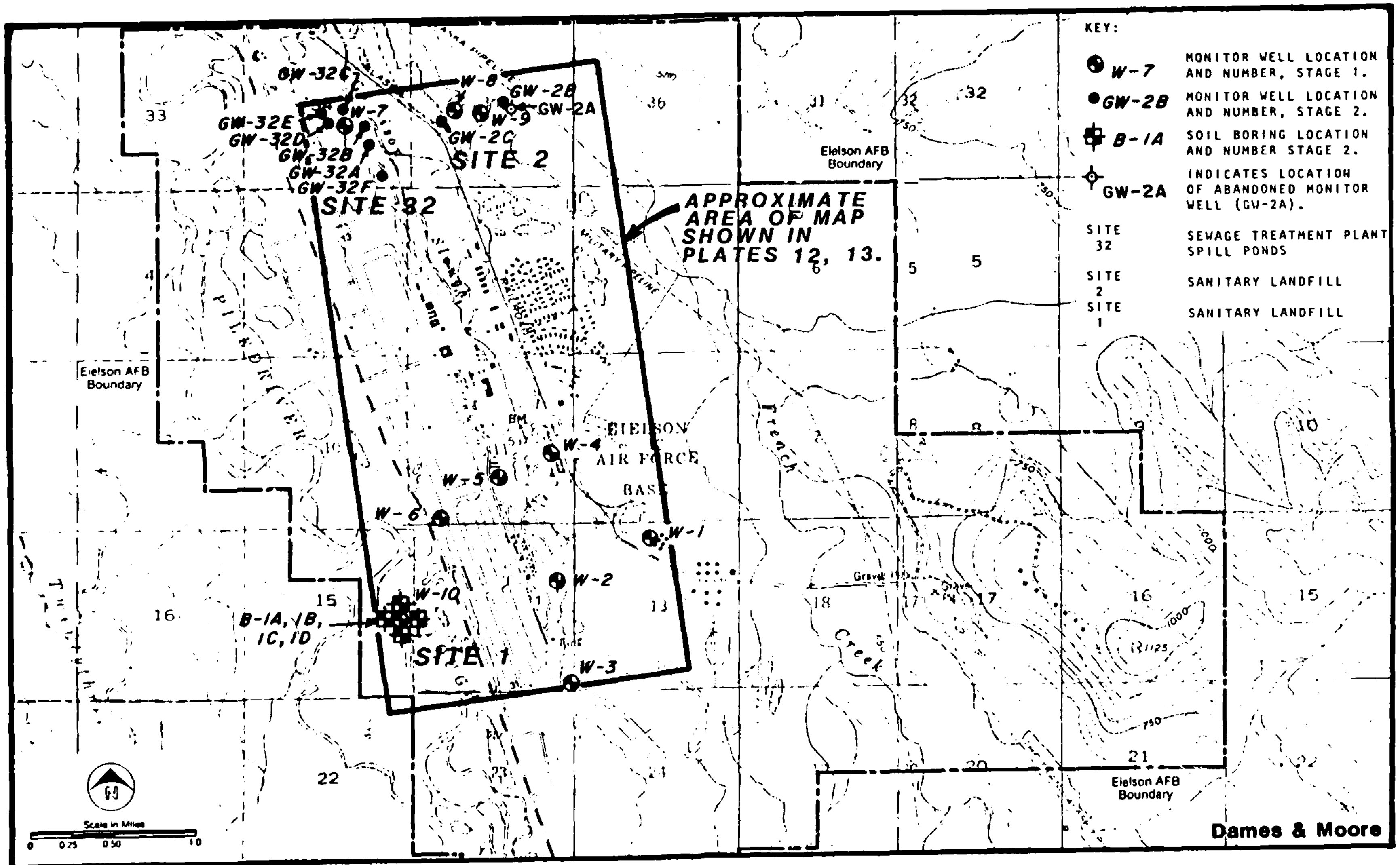
This was the site of the base sanitary landfill from 1960 to 1967. Base refuse was burned at this site until about 1964, when burning was halted. After landfilling operations ceased in 1967, a cover of fly ash from the Central Heating and Power Plant was placed on the site. Hazardous materials, including waste oils, spent solvents, and paint residues and thinners, were reportedly disposed of at this site.

3. Site 1: Original Base Landfill (1950-1960)

This was the main base landfill from about 1950 to 1960. At present, vegetation on the site has regrown in the form of a low ground cover and alder trees. Hazardous materials, including waste oils, spent solvents, and paint residues and thinners, were reportedly disposed of at this site (CH2M Hill, 1982). Burning was reportedly not conducted at this site.

E. IDENTIFICATION OF POLLUTANTS SAMPLED

Based on the wastes present in the above sites and the results of chemical analyses of samples from the Phase II, Stage 1, investigation



SOURCE: CH2MHILL (1982), ADAPTED FROM EIELSON AIR FORCE BASE WATER SUPPLY SYSTEM MASTEP PLAN.

LOCATION OF MONITOR WELLS PHASE II STAGES 1 AND 2
EIELSON AFB, ALASKA

PLATE 2

(Dames & Moore, 1986), potential contaminants include petroleum hydrocarbons, volatile organics, pesticides, nitrates, phosphates, lead, arsenic, cadmium, mercury, and silver. The analytical program is provided in Table 1.

F. IDENTIFICATION OF THE FIELD TEAM

The field work for Phase II, Stage 2, was accomplished under the overall supervision of Mr. Jon Michael Stanley, Senior Engineering Geologist. Borehole drilling and monitor well installation were completed under the supervision of Ms. Amy D. Lamborg, Assistant Geologist. The well development and water sampling program was accomplished by Mr. Stanley and Ms. Kay L. Tauscher, Assistant Geologist. The geophysical survey was conducted by Mr. Thomas S. Jensen, Senior Geologist/Geophysicist. Drilling services were provided by Tester Drilling Services, Inc., and surveying was conducted by Kean and Associates, both of Anchorage, Alaska. Appendix K contains biographies of key personnel.

TABLE 1

DETAILED ANALYTICAL PROGRAM
METHODS OF ANALYSIS AND REPORTED DETECTION LIMITS,
WATER QUALITY CRITERIA AND SAMPLING SCHEME
WATER SAMPLES
EIELSON AFB
IRP PHASE II, STAGE 2

PARAMETER	METHOD	UNITS	DETECTION LIMIT	PRIMARY OR SECONDARY DRINKING WATER STANDARDS	SITE 32	SITE 2	SITE 1
					NUMBER OF SAMPLES		
Purgeable Halocarbons	EPA 601[a]	ug/L	MDL[b]	Total Trihalomethanes = 100	7	4	1
Bromodichloromethane	EPA 601[a]	ug/L	0.35	N.E.			
Bromoform	EPA 601[a]	ug/L	0.45	N.E.			
Bromomethane	EPA 601[a]	ug/L	0.33	N.E.			
Carbon Tetrachloride	EPA 601[a]	ug/L	0.46	N.E.			
Chlorobenzene	EPA 601[a]	ug/L	0.37	N.E.			
Chloroethane	EPA 601[a]	ug/L	0.38	N.E.			
2-Chloroethylvinyl Ether	EPA 601[a]	ug/L	0.44	N.E.			
Chloroform	EPA 601[a]	ug/L	0.45	N.E.			
Chloromethane	EPA 601[a]	ug/L	0.49	N.E.			
Dibromochloromethane	EPA 601[a]	ug/L	0.31	N.E.			
1,2-Dichlorobenzene	EPA 601[a]	ug/L	0.29	N.E.			
1,3-Dichlorobenzene	EPA 601[a]	ug/L	0.42	N.E.			
1,4-Dichlorobenzene	EPA 601[a]	ug/L	0.41	N.E.			
Dichlorodifluoromethane	EPA 601[a]	ug/L	0.33	N.E.			
1,1-Dichloroethane	EPA 601[a]	ug/L	0.49	N.E.			
1,2-Dichloroethane	EPA 601[a]	ug/L	0.44	N.E.			
1,1-Dichloroethene	EPA 601[a]	ug/L	0.49	N.E.			
trans-1,2-Dichloroethene	EPA 601[a]	ug/L	0.42	N.E.			
1,2-Dichloropropane	EPA 601[a]	ug/L	0.20	N.E.			
cis-1,3-Dichloropropene	EPA 601[a]	ug/L	0.58	N.E.			
trans-1,3-Dichloropropene	EPA 601[a]	ug/L	0.39	N.E.			
Methylene Chloride	EPA 601[a]	ug/L	0.34	N.E.			
1,1,2,2-Tetrachloroethane	EPA 601[a]	ug/L	0.38	N.E.			
Tetrachloroethene	EPA 601[a]	ug/L	0.38	N.E.			
1,1,1-Trichloroethane	EPA 601[a]	ug/L	0.53	N.E.			
1,1,2-Trichloroethane	EPA 601[a]	ug/L	0.51	N.E.			
Trichloroethene	EPA 601[a]	ug/L	0.60	N.E.			
Trichlorofluoromethane	EPA 601[a]	ug/L	0.44	N.E.			
Vinyl Chloride	EPA 601[a]	ug/L	0.54	N.E.			
Purgeable Aromatics	EPA 602[a]	ug/L	MDL[b]	N.E.	7	4	1
Benzene	EPA 602[a]	ug/L	0.25	N.E.			
Chlorobenzene	EPA 602[a]	ug/L	0.35	N.E.			
1,2-Dichlorobenzene	EPA 602[a]	ug/L	0.47	N.E.			
1,3-Dichlorobenzene	EPA 602[a]	ug/L	0.93	N.E.			
1,4-Dichlorobenzene	EPA 602[a]	ug/L	0.44	N.E.			
Ethylbenzene	EPA 602[a]	ug/L	0.75	N.E.			
Toluene	EPA 602[a]	ug/L	0.64	N.E.			
m-Xylene	EPA 602[a]	ug/L	0.45	N.E.			
o-Xylene	EPA 602[a]	ug/L	0.78	N.E.			
p-Xylene	EPA 602[a]	ug/L	0.78	N.E.			
Petroleum Hydrocarbons	EPA 418.1[c]	mg/L	0.2	N.E.	7	4	1
TDS	EPA 160.1[c]	mg/L	10.	500	7	4	1
TOC	EPA 415.1[c]	mg/L	1.	N.E.	7	0	0
Total Phosphate	EPA 365.4[c]	mg/L	0.1	N.E.	7	0	0
Nitrate, Nitrite	EPA 353.2[c]	mg/L	0.01	10 (nitrogen)	7	0	0
Lead	EPA 239.2[c]	mg/L	0.005	0.05	7	4	1
Arsenic	EPA 206.2[c]	mg/L	0.001	0.05	0	4	0
Cadmium	EPA 200.7[c]	mg/L	0.004	0.01	0	4	0
Chromium	EPA 200.7[c]	mg/L	0.007	0.05	0	4	0
Mercury	EPA 245.1[c]	mg/L	0.0002	0.002	0	4	0
Silver	EPA 200.7[c]	mg/L	0.007	0.05	0	4	0

TABLE 1 (Continued)

PARAMETER	METHOD	UNITS	DETECTION LIMIT	PRIMARY OR SECONDARY DRINKING WATER STANDARDS	SITE 32	SITE 2	SITE 1
					NUMBER OF SAMPLES		
Pesticides	EPA 608[a]	ug/L	MDLb	N.E.	0	0	1
Aldrin	EPA 608[a]	ug/L	0.005	N.E.			
alpha-BHC	EPA 608[a]	ug/L	0.0004	N.E.			
beta-BHC	EPA 608[a]	ug/L	0.001	N.E.			
delta-BHC	EPA 608[a]	ug/L	0.002	N.E.			
Lindane	EPA 608[a]	ug/L	0.004	4.0			
Chlordane	EPA 608[a]	ug/L	0.01	N.E.			
4,4'-DDD	EPA 608[a]	ug/L	0.001	N.E.			
4,4'-DDE	EPA 608[a]	ug/L	0.001	N.E.			
4,4'-DDT	EPA 608[a]	ug/L	0.005	N.E.			
Dieldrin	EPA 608[a]	ug/L	0.003	N.E.			
Endosulfan I	EPA 608[a]	ug/L	0.008	N.E.			
Endosulfan II	EPA 608[a]	ug/L	0.004	N.E.			
Endosulfan Sulfate	EPA 608[a]	ug/L	0.018	N.E.			
Endrin	EPA 608[a]	ug/L	0.002	0.2			
Endrin Aldehyde	EPA 608[a]	ug/L	0.021	N.E.			
Heptachlor	EPA 608[a]	ug/L	0.01	N.E.			
Heptachlor Epoxide	EPA 608[a]	ug/L	0.003	N.E.			
Toxaphene	EPA 608[a]	ug/L	0.1	5.0			
pH	field	units	-----	6.5 TO 8.5	7	4	1
Temperature	field	°C	-----	N.E.	7	4	1
Conductivity	field	umhos/cm	-----	N.E.	7	4	1

SOIL SAMPLES

PARAMETER	METHOD	UNITS	DETECTION LIMIT	PRIMARY OR SECONDARY DRINKING WATER STANDARDS	SITE 32	SITE 2	SITE 1
					NUMBER OF SAMPLES		
Pesticides	EPA SW3550/8080[d]	mg/kg	MDL[b]	N.A.	0	0	16
Aldrin	EPA SW3550/8080[d]	mg/kg	0.005	N.A.			
alpha-BHC	EPA SW3550/8080[d]	mg/kg	0.0004	N.A.			
beta-BHC	EPA SW3550/8080[d]	mg/kg	0.0001	N.A.			
delta-BHC	EPA SW3550/8080[d]	mg/kg	0.0002	N.A.			
Lindane	EPA SW3550/8080[d]	mg/kg	0.0004	N.A.			
Chlordane	EPA SW3550/8080[d]	mg/kg	0.001	N.A.			
4,4'-DDD	EPA SW3550/8080[d]	mg/kg	0.0002	N.A.			
4,4'-DDE	EPA SW3550/8080[d]	mg/kg	0.0005	N.A.			
4,4'-DDT	EPA SW3550/8080[d]	mg/kg	0.0005	N.A.			
Dieldrin	EPA SW3550/8080[d]	mg/kg	0.0003	N.A.			
Endosulfan I	EPA SW3550/8080[d]	mg/kg	0.0008	N.A.			
Endosulfan II	EPA SW3550/8080[d]	mg/kg	0.0004	N.A.			
Endosulfan Sulfate	EPA SW3550/8080[d]	mg/kg	0.0018	N.A.			
Endrin	EPA SW3550/8080[d]	mg/kg	0.0002	N.A.			
Endrin Aldehyde	EPA SW3550/8080[d]	mg/kg	0.0021	N.A.			
Heptachlor	EPA SW3550/8080[d]	mg/kg	0.001	N.A.			
Heptachlor Epoxide	EPA SW3550/8080[d]	mg/kg	0.0003	N.A.			
Toxaphene	EPA SW3550/8080[d]	mg/kg	0.1	N.A.			
Moisture	ASTM D2216-71[e]	%	1.0	N.A.	0	0	16

[a]"Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," Federal Register, Volume 49, Number 209, Friday, October 26, 1984.
[b]Determined according to the procedure in Federal Register Friday, October 26, 1984, Part VIII.
[c]"Methods for Chemical Analysis of Water and Wastes," EPA Manual 600/4-79-020, USEPA, March 1983.
[d]"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 2nd Edition, USEPA, 1982.
[e]ASTM D2216-71 "Laboratory Determination of Moisture Content of Soil."
N.E. = No Criterion Established.
N.A. = Not Applicable
MDL = Method Detection Limits

II. ENVIRONMENTAL SETTING

A. PHYSICAL GEOGRAPHY

Eielson AFB is located in the Tanana River Valley in interior Alaska, approximately 23 miles southeast of the city of Fairbanks. The base encompasses approximately 19,790 acres and is isolated from major urban areas. Land surface elevations range from 525 feet to as high as 1,125 feet MSL, although the developed portion of the base lies between 525 and 550 feet MSL.

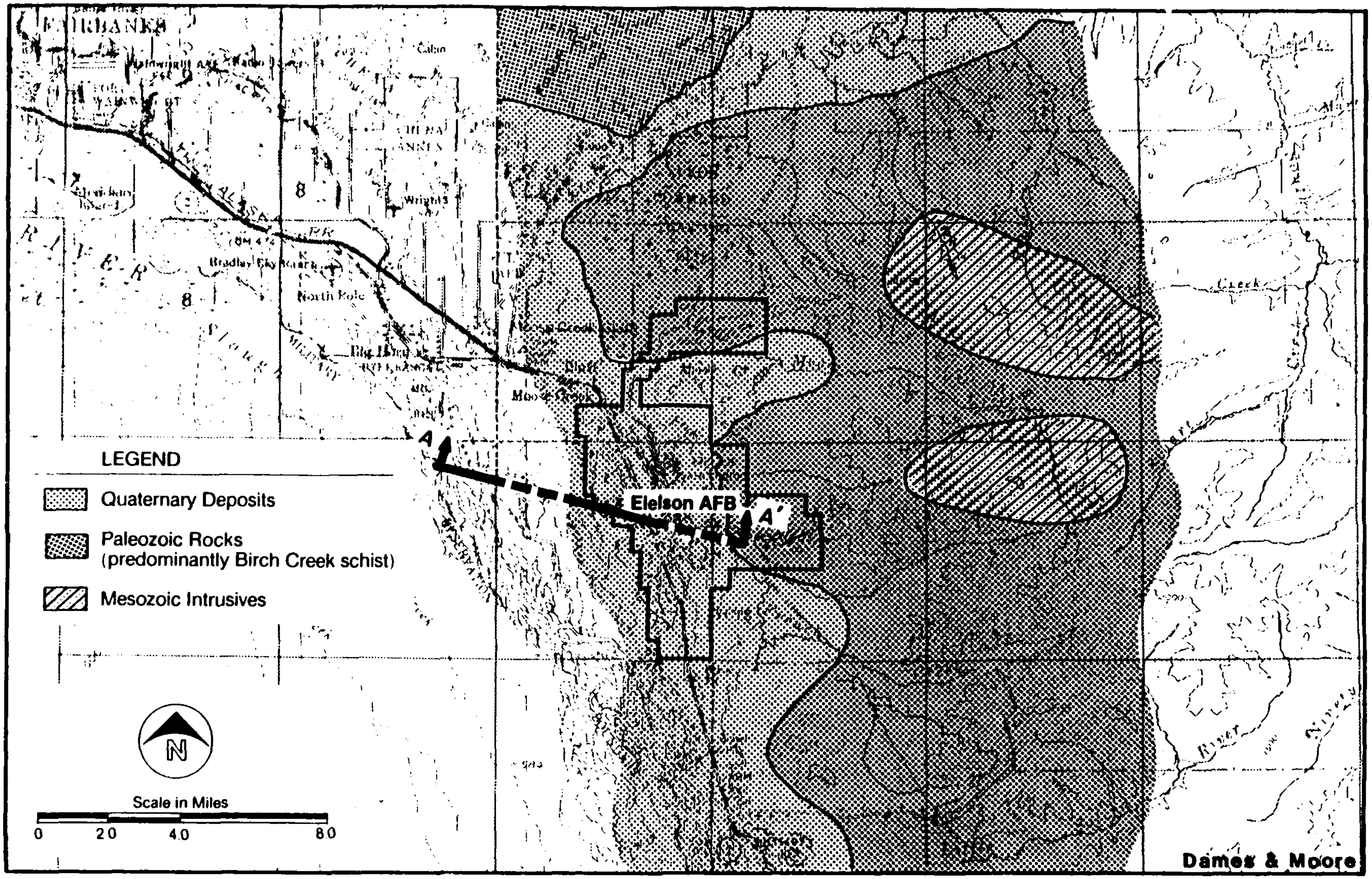
The base is located on the geological floodplain of the Tanana River, approximately 2 miles east of the river. The Tanana-Kuskokwim Lowland, on which the Tanana River flows, is a smooth glaciofluvial outwash plain occurring at the foot of the Alaska Range, which lies approximately 100 miles south of Eielson AFB. A portion of the base lies on the Yukon-Tanana Upland to the east, an area characterized by rounded, even-topped ridges with gentle side slopes and broad undulating divides with flat-topped spurs. All regional drainage is toward the Tanana River and, hence, northwest into the Yukon River.

The average annual precipitation at the base is 14 inches which includes 70 inches of snow. Maximum snowfall is generally confined to October through February. The mean monthly temperatures range from a low of -14°F in January to a high of 61°F in July, with a maximum low of -64°F and a maximum high of 93°F (CH2M Hill, 1982).

B. REGIONAL GEOLOGY AND HYDROGEOLOGY

The Tanana-Kuskokwim Lowland is a broad glaciofluvial outwash plain confined on the south by the Alaska Range and on the north by the Yukon-Tanana Upland. Bedrock is exposed in the upland and consists predominantly of Precambrian metamorphic schist, the quartz-mica Birch Creek Schist, with some Mesozoic intrusives. The schist is the regional basement rock, the surface of which is characteristically uneven and weathered to varying depths.

The regional consolidated deposits are overlain by substantial accumulations of unconsolidated Quaternary fluvial and glaciofluvial sediments shed from the rising Alaska Range. A thin layer of sandy loam overlies a thick sequence of sand and gravel. Unconsolidated sediments are approximately 200 to 300 feet thick under Eielson AFB. A map of the general geology of the area is provided as Plate 3.



SOURCE: CH2MHILL (1982), MODIFIED
FROM PEWÉ, ET AL., (1966)

GEOLOGIC MAP OF EIELSON AIR FORCE BASE AREA

PLATE 3

In soils near main streams, permafrost (ground that has been frozen for 2 or more consecutive years) is generally absent. Away from the streams, soils are fine-grained and have shallow permafrost. Plate 4 provides a generalized west-east geologic section that illustrates the relationship between the permafrost and surface water. Deeper sediments are unfrozen due to the presence of large quantities of ground water.

Ground water occurs as a water table aquifer under Eielson AFB. The water level is approximately 5 feet below the ground surface at an elevation of approximately 535 feet MSL. The regional hydraulic gradient is probably close to the slope of the ground surface, approximately 4 to 6 feet/mile, which results in relatively slow movement of ground water in the area; the direction of regional ground water flow is north-northwest. The aquifer is recharged by the Tanana River and its tributaries, and by infiltration of rainfall and snowmelt (CH2M Hill, 1982).

Past stream deposition governs the availability of ground water at Eielson AFB with the central portion of main stream channels being quite permeable. The availability of ground water in the vicinity of the base is illustrated on Plate 5. Most of the developed portion of the base is located in an area of high ground water availability.

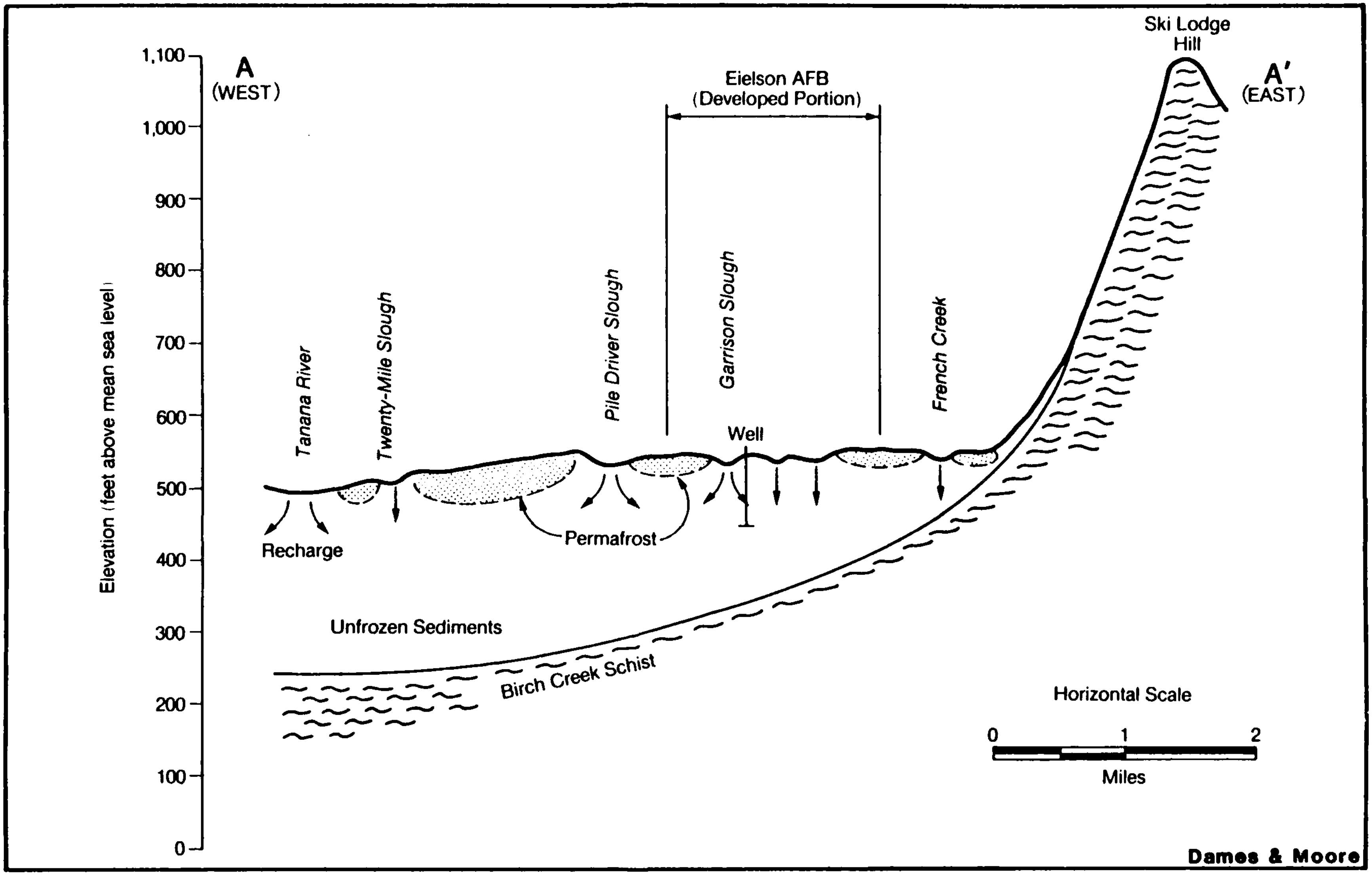
C. GENERAL HYDROGEOLOGY

Eielson AFB is located over the shallow aquifer recognized in the vicinity, and the base receives its water supply from wells drilled into this aquifer (Plate 6). The wells are from 4 to 20 inches in diameter and from 80 to 250 feet deep. They are typically screened and gravel packed with specific capacities in the range of 50 to 400 gpm/foot of drawdown.

The major characteristics of the aquifer can be summarized as follows:

Lithology: sand and gravel
Depth of occurrence: 5 to 300 feet
Permeability: 1.0x10-1 cm/sec (estimated)
Yield Range: 6 to 3,000 gpm

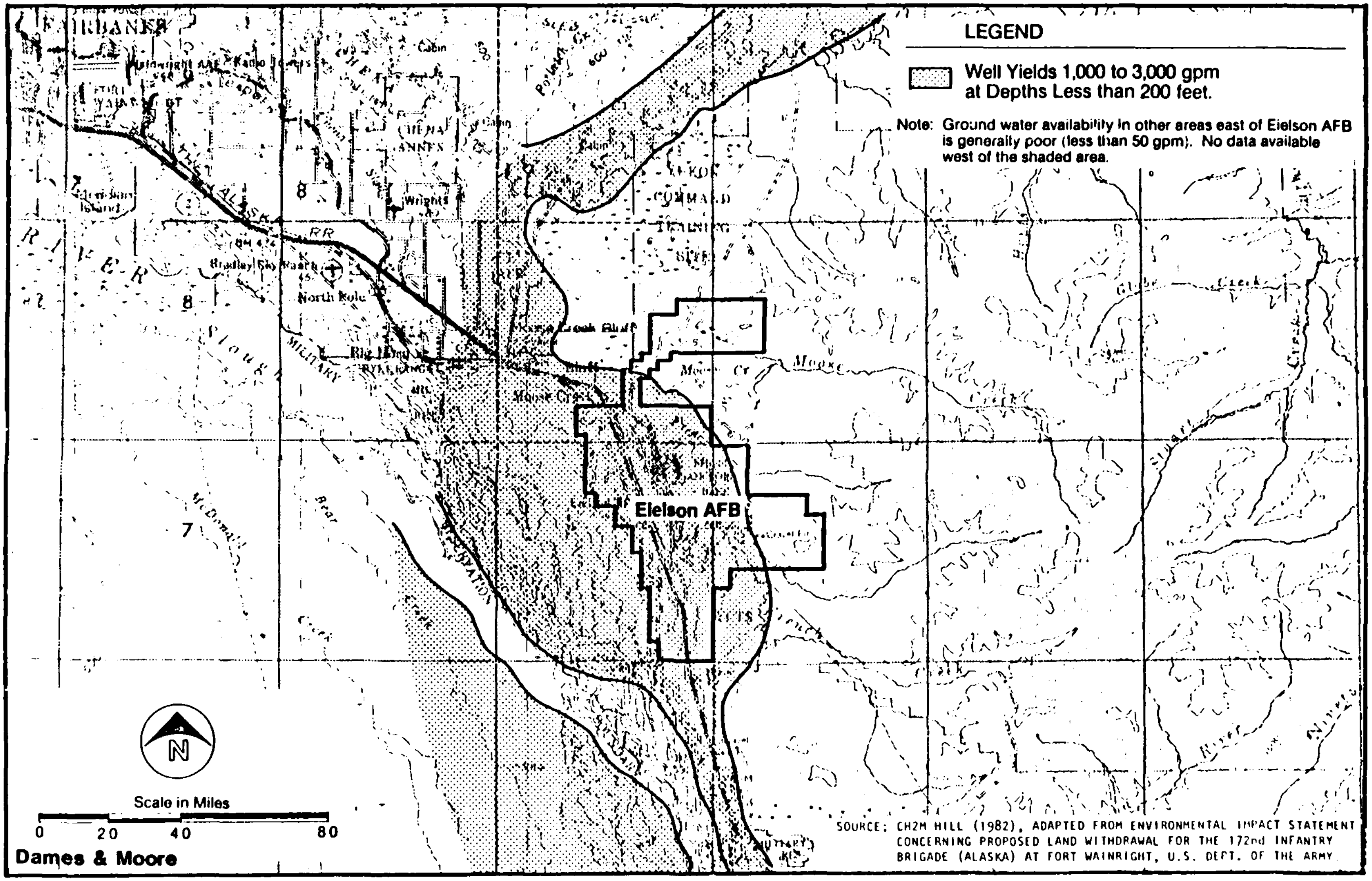
The base water supply wells yield 1,000 to 2,000 gpm. The aquifer at Eielson AFB is approximately 250 feet thick and likely extends through the unconsolidated materials to the bedrock (Birch Creek Schist). Water quality is good except for high iron in some wells. The aquifer is limited



SOURCE; CH2MHILL (1982)

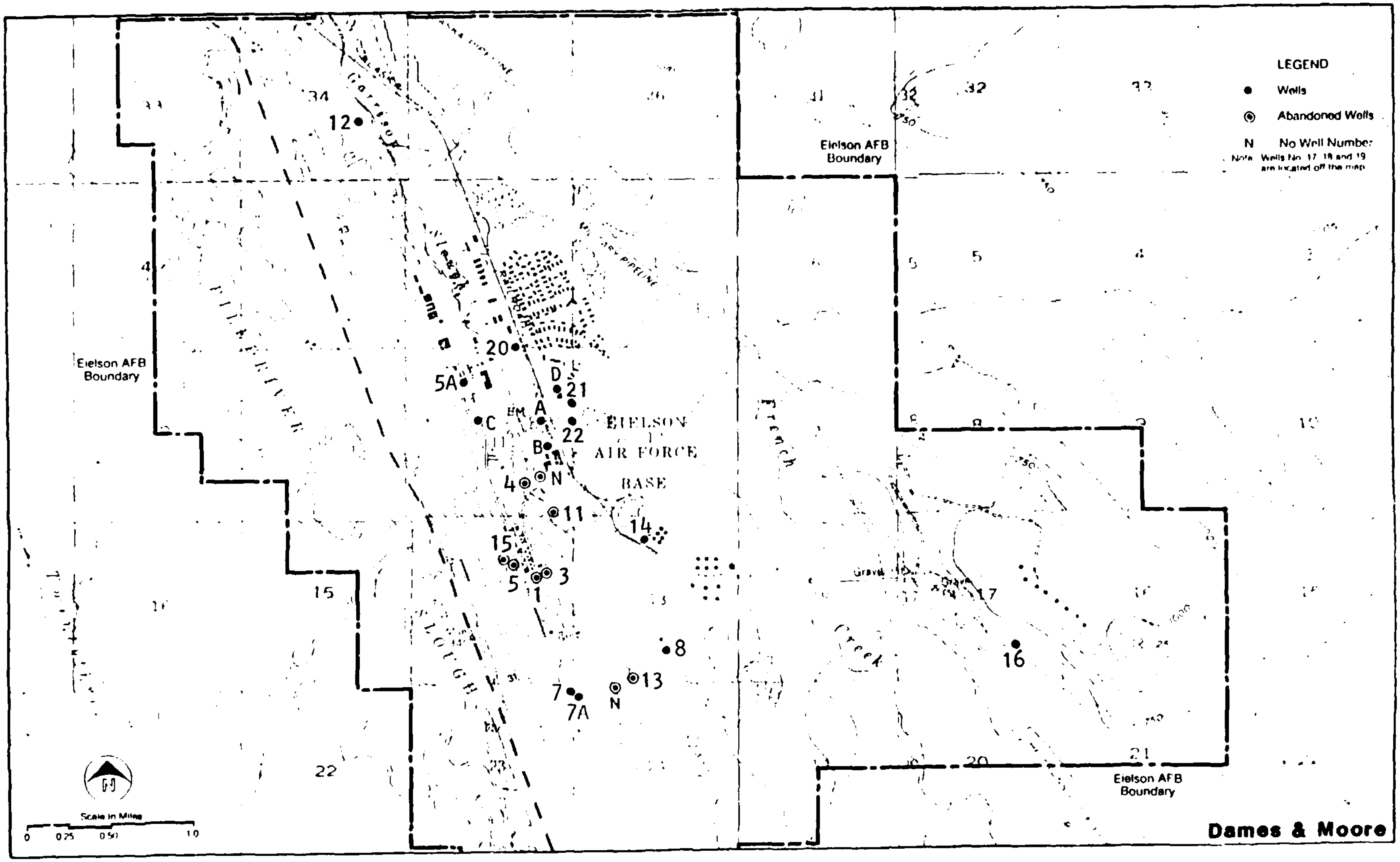
GENERALIZED WEST-EAST GEOLOGIC SECTION
CROSS - SECTION A - A'

PLATE 4



GROUND WATER AVAILABILITY IN THE VICINITY OF EIELSON AIR FORCE BASE

PLATE 5



SOURCE: CH2MHILL (1982), ADAPTED FROM EIELSON AIR FORCE BASE WATER SUPPLY SYSTEM MASTER PLAN

POTABLE WATER WELL LOCATIONS, EIELSON AIR FORCE BASE

PLATE 6

in areal extent to the broad valley of the Tanana River Basin; at Eielson AFB, this valley is approximately 45 to 50 miles wide (CH2M Hill, 1982). Since the developed portion of the base is close to the Tanana River and local streams, there is little permafrost underlying the area. In fact, there are few impeding factors to slow the downward percolation of water or contaminants to the aquifer. There are no extensive silt or clay layers; the low silt and clay content of the sediments results in low adsorption. Contaminants could be expected to reach the water table quickly and to migrate downgradient with ground water flow.

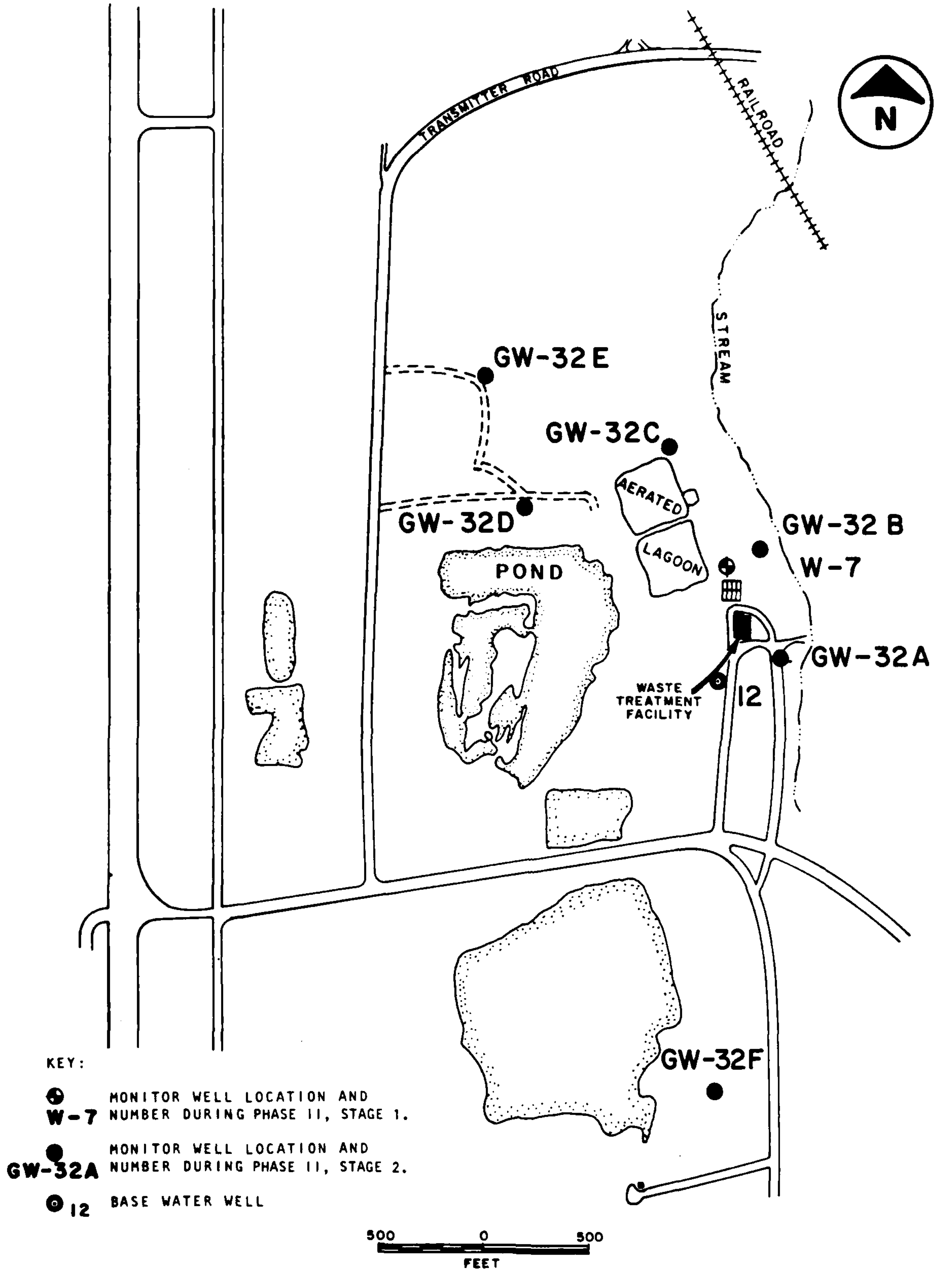
D. SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

This section presents the results of the investigations conducted during Phase II, Stages 1 (Dames & Moore, 1986) and 2, at the three previously listed sites at Eielson AFB. The logs of monitor wells installed during Stage 2 are presented in Appendix D. The Phase II, Stage 2, field program is described in Section III and the results of the chemical analyses are presented in Section IV.

1. Site 32

This site is the location of the sewage treatment plant spill ponds and the treated effluent leaching ponds. During Phase II, Stage 1, one monitor well, W-7, was installed to a depth of 24 feet. It is located generally downgradient of the spill ponds and sewage sludge drying containments. Based on analysis of the water levels in the Stage 1 wells and the results of an EM survey at the site, two wells (GW-32A and GW-32F) were installed upgradient of the site and four wells were installed downgradient of the site. Two of the wells (GW-32B and GW-32C) were placed in areas where high electromagnetic conductivity was found during the EM survey and two (GW-32D and GW-32E) were placed hydraulically downgradient of the treated effluent leaching ponds. The wells were installed at the locations shown on Plates 2 and 7.

The subsurface materials encountered at this site were primarily sand with lesser amounts of gravel and silt (see logs, Appendix D). Water was encountered at a depth of 9.0 feet (12 July 1984) in Well W-7 and at depths ranging from 4.0 to 7.0 feet (15-16 August 1986) in Wells GW-32A, GW-32B, GW-32C GW-32D, GW-32E, and GW-32F. In Well W-7, soil samples contained 7.1 percent moisture at 10 feet and 13 percent moisture at 15 feet. No soil samples from the Stage 2 exploration program were retained for testing. Although a strong sewage smell was detected in Wells GW-32D and GE-32E, explosimeter readings were low at all of the borehole locations.



SITE 32, SEWAGE TREATMENT PLANT AND MONITOR WELLS W-7, GW-32A, GW-32B, GW-32C, GW-32D, GW-32E, AND GW-32F

Dames & Moore

PLATE 7

Ground water gradient maps and additional discussions on hydrogeology are presented in Section III.

2. Site 2

Site 2 is the location of an old base landfill which was used from 1960 to 1967. During Phase II, Stage 1, two monitor wells, W-8 and W-9, were completed to depths of 21 and 26 feet, respectively. They are located generally downgradient of the landfill. Based on analysis of the water levels in the Stage 1 wells, one additional well (GW-2B) was installed to a depth of 14.5 feet upgradient of the landfill and one well (GW-2C) was installed to a depth of 15.5 feet downgradient. One boring (GW-2A) near the location of Well GW-2B was abandoned at a depth of 24.5 feet and grouted closed as permafrost was encountered from approximately 2.5 to 24.5 feet. The locations of the wells and borings are shown on Plates 2 and 8.

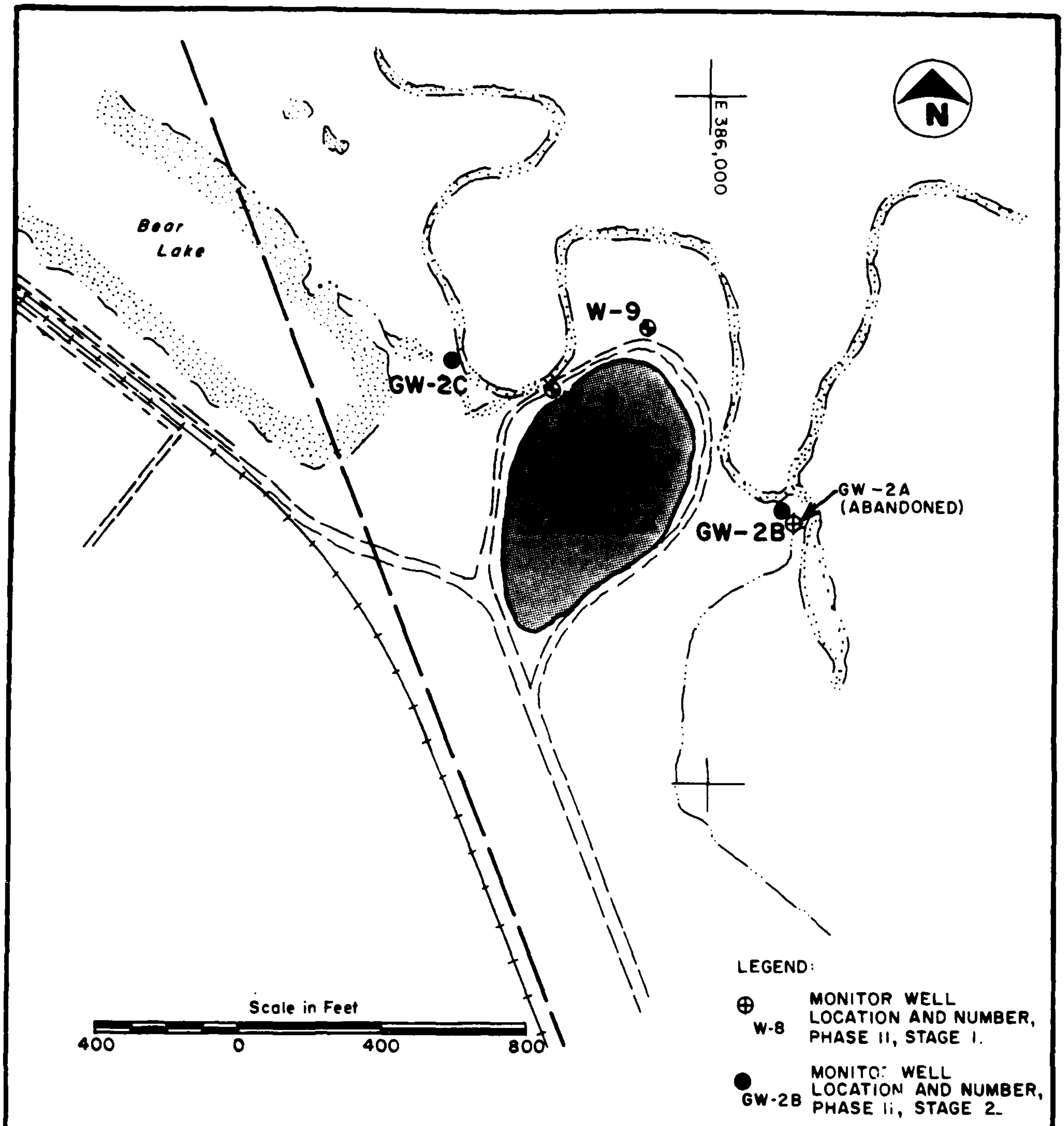
The subsurface materials encountered at this site consisted primarily of sand and gravel with lesser amounts of silt, although a considerable amount of silt was found in Boring GW-2A (see logs, Appendix D). Water was encountered at a depth of 6.0 feet in Wells W-8 and W-9 (12 July 1984). Analyzed soil samples ranged from 14 to 21 percent moisture in these wells. No water was found in Boring GW-2A, however, water was found at a depth of 7.0 feet (14 August 1986) in both Wells GW-2B and GW-2C. Explosimeter readings were low at the borehole locations.

Additional discussions on hydrogeology and the ground water table map are presented in Section III.

3. Site 1

Site 1 is the location of an old base landfill used from 1950 to 1960. During Phase II, Stage 1, one monitor well (W-10) was completed to a depth of 25 feet near the downgradient edge of the site. It was not possible to determine the exact limits of the original landfill but, based on the materials encountered during drilling, it appears that the well was installed in undisturbed material. During Phase II, Stage 2, four soil borings were installed orthogonally, approximately 15 feet from Well 10, to depths of 9.0 feet. The locations of Well W-10 and the four soil borings (B-1A, B-1B, B-1C, and B-1D) are shown on Plates 2 and 9.

The subsurface materials encountered at this site consist primarily of sand with lesser amounts of gravel and silt (see logs, Appendix D). Water was encountered at a depth of 9.0 feet (13 July 1986) in Well W-10 and at

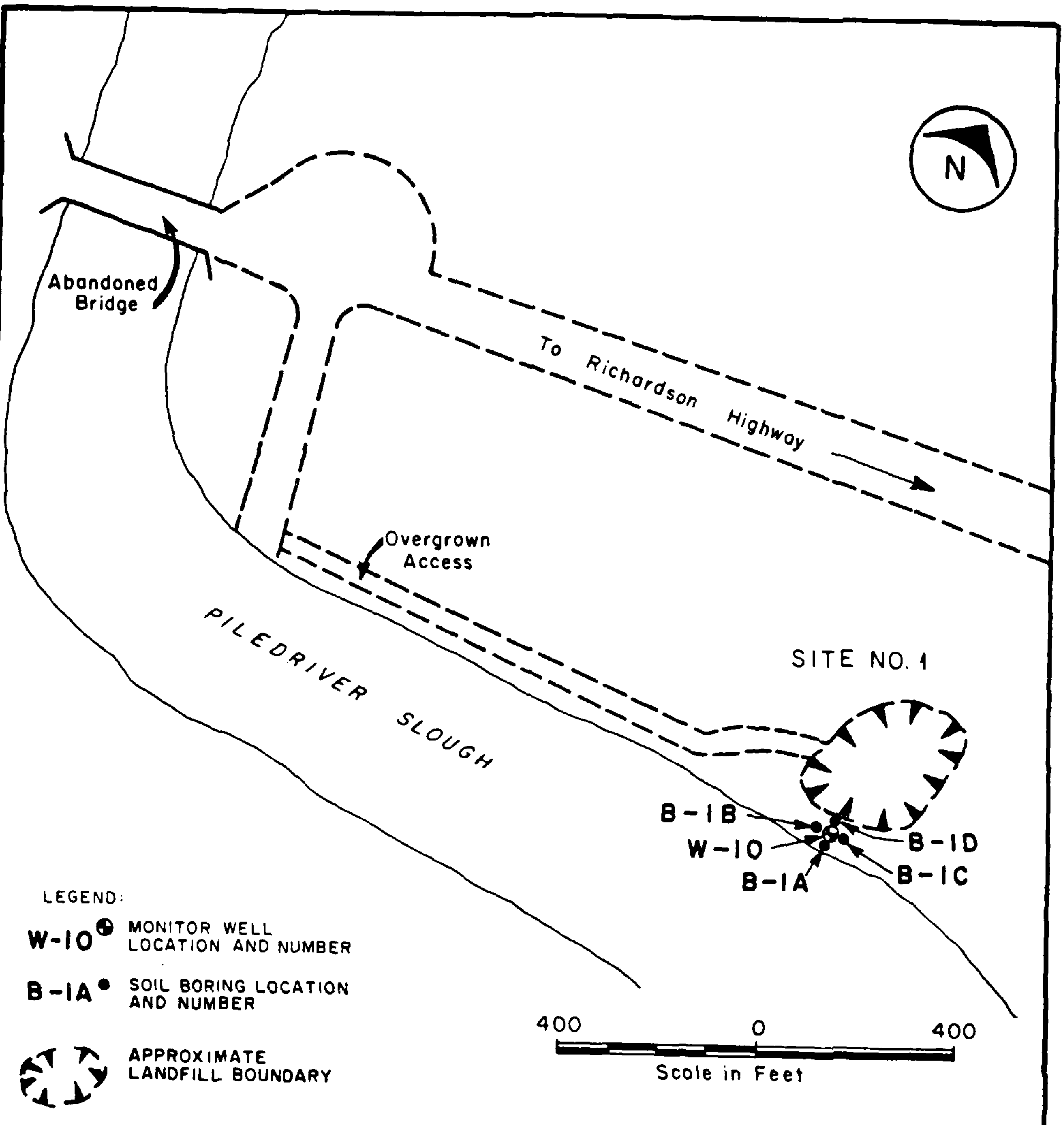


SITE 2, OLD BASE LANDFILL, AND
MONITOR WELLS W-8, W-9, GW-2B, AND GW-2C

SOURCE: ADAPTED FROM MASTER PLAN LIQUID FUEL SYSTEM-EIELSON AIR FORCE BASE, DRG G-7 SHEET 1 OF 3 AND SHEET 2 OF 3 (1974).

Dames & Moore

PLATE 8



SITE 1, ORIGINAL BASE LANDFILL,
STAGE 1 - MONITOR WELL W-10
STAGE 2 - SOIL BORINGS, B1-A, B1-B, B-1C, AND B1-1D

Dames & Moore

PLATE 9

depths of 7.5, 7.0, 8.8, and 8.0 feet (13 August 1986) in Borings B-1A, B-1B, B-1C, and B-1D, respectively. Moisture content in soil samples from Well W-10 that were tested ranged from 3.1 percent at the surface to 14 percent at 20 feet. Explosimeter readings were low at the boring locations.

Section III contains additional information on hydrogeology and the ground water table map.

E. HISTORIC GROUND WATER PROBLEMS

Although water quality from most wells penetrating the aquifer underlying Eielson AFB has generally been good with the exception of high iron content, there appear to be water quality problems at the base, primarily associated with POL disposal or spills. These problems are being addressed by another contractor under a Phase IV IRP program currently underway at Eielson AFB. No historic ground water problems associated with the sites of concern addressed under Phase II, Stage 2, have been noted. Any pollutants migrating from the sites investigated, however, will very likely reach the ground water table as the soils are very permeable and the water table is quite shallow. The potential for contamination is high.

F. LOCATIONS OF WELLS ON AND OFF BASE

Eielson AFB derives its water supply from three primary water supply wells and two emergency wells. Two other large capacity wells not connected to the main water supply system provide water for the power plant. One well supplies water for fire protection and is not connected to the main supply system. Eight low-capacity wells supply water to remote sites not connected to the main water supply system. There are ten abandoned or decommissioned wells on the base. The well locations are provided on Plate 6 and Table 2 lists their construction data. No off-base well locations have been identified at this time, although it is certain that private water supply wells are located in the community of Moose Creek, approximately 1/4 to 1/2 miles north-northwest of the installation boundaries and downgradient of on-site pollutants. The United States Geological Survey (USGS) was contacted to obtain well logs for Moose Creek wells. An extensive search of their files failed to locate any logs for these wells. It is believed that many of the wells were hand-driven by homeowners and well logs do not exist.

TABLE 2

CONSTRUCTION DETAILS OF POTABLE WATER WELLS AT EIELSON AFB

WELL NUMBER	LOCATION	DEPTH (ft)	CASING SIZE (inches)	FLOW (gpm)	REMARKS
A	Building No. 3408	96	12	1000	Main system
B	Building No. 3430	96	12	1000	Main system
C	Building No. 1201	96	12	1000	Main system, emergency only
D	Building No. 6204	96	18	2000	Main system
1	Building No. 4355	96	8	80 - 250	Pumps removed, line cut, abandoned
2	N223,800-E388,200	96	8	80 - 250	Pumps removed, line cut and plugged
3	N223,900-E388,600	96	8	80 - 250	Pumps removed, line cut and plugged
4	N227,300-E387,900	96	8	80 - 250	Abandoned
5	Building No. 1225	96	4	80 - 250	Pump removed
5A	Building No. 1164	96	8	490	Main system, automatic emergency only
7	Building No. 1301	96	12	1000	Fire pump not connected to main
7A	Building No. 1301	96	6	150	Secondary main system
8	Building No. 1307	90	4	10	
9	N226,000-E388,400	--	--	--	Abandoned
11	N226,600-E389,300	--	--	--	Abandoned
12	Building No. 2318	96	8	150	Sewage treatment plant
13	Building No. 1317	90	4	6.67	Abandoned
14	Building No. 6224	96	4	6.67	
15	Building No. 1216	90	4	6.67	Weather site, abandoned
16	Building No. 6395	150	4	6.67	Ski lodge
17	Building No. 500	96	8	85	Transmitter site, abandoned
18	Building No. 6151	250	6	150	Engineer Hill
19	Building No. 2030	140	4	8	Birch Lake
20	Building No. 3351	80	6	120	
21	Building No. 6200	112	20	3000	Water supply - power plant
22	Building No. 6201	118	20	3000	Water supply - power plant

Source: Master Plan, Water Supply System, Eielson AFB, updated September 30, 1981.

III. FIELD PROGRAM

A. FIELD PROGRAM DEVELOPMENT

The field program portion of the Phase II, Stage 2, study consisted of:

1. Performing an EM survey in two areas of Site 32;

2. Drilling, soil sampling of four soil borings, installing and developing eight monitor wells, and measuring water levels at three sites on the base;

3. Conducting a slug test to determine the hydraulic conductivity of the soils in the vicinity of Site 32;

4. Preparing geologic logs for each boring and monitor well; and

5. Collecting samples for water quality analyses from each monitor well and collecting soil samples for chemical analysis from the four soil borings.

B. FIELD PROGRAM IMPLEMENTATION

1. Geophysical Survey

The extent of potential migration of contaminants from the waste treatment facility was investigated by geophysical means using electromagnetic (EM) terrain conductivity profiling. EM profiling does not require direct contact with the earth through the use of electrodes as do electrical resistivity methods. Instead, EM profiling uses a system which induces a small electrical current in the ground by means of a transmitter loop antenna. The small eddy currents which are formed produce a secondary magnetic field, the strength of which is a function of current flow. The secondary magnetic field is intercepted by a receiver coil. The strength of the secondary field in relation to the earth's primary field is proportional to the terrain conductivity. The depth of investigation by EM is a function of the intercoil spacings and the orientation of the antenna loops.

Eleven EM profile lines were established in the vicinity of the waste treatment facility. The results of the geophysical survey are presented in Section IV.

The EM profiling was done using a Geonics model EM-31D terrain conductivity meter. The EM-31D has an intercoil spacing of approximately 12 feet. Used in the vertical dipole mode, the EM-31D has an effective depth of investigation of approximately 20 feet. Within this depth, approximately 50 percent of the meter reading contribution is derived from the upper 10 feet.

2. Soil Borings

Four soil borings were drilled at Site 1 on Eielson AFB. The borings were drilled using a truck-mounted rotary drill rig with 8-inch diameter hollow-stem augers operated by Tester Drilling Services, Inc., of Anchorage, Alaska. Samples were collected using a 2.0- or 2.5-inch split spoon sampler, driven by a 340-pound drop hammer, at 2.5-foot intervals. The collected samples were split vertically and placed into prepared 1-pint glass containers with Teflon® lined lids. The samples were frozen at the end of each working day. They were shipped to the testing labs following completion of soil sampling. The sampler was thoroughly cleaned with an Alconox detergent and distilled water solution and rinsed with methanol followed by distilled water before and after each use. Descriptions of the samples were made in the field by an experienced Dames & Moore geologist and were used to prepare geologic logs for each borehole. Upon completion of the sampling, the boreholes were grouted to the surface with a cement-bentonite mixture.

The boreholes were to be monitored for organic vapors and explosive gases during drilling using an HNu photoionization meter and an explosimeter. Readings were to be taken with both meters at the top of the borehole during drilling and immediately before sampling operations and recorded on the field borehole logs. However, it was found that the ultraviolet lamp in the HNu meter was burned out when the unit was used shortly after arrival at Eielson AFB (although it had been checked and was functioning properly in Anchorage before the field program started). A replacement lamp could not be located in time to use the meter during the completion of the program at Eielson AFB.

The primary purpose of the HNu was to monitor for the presence of organic vapors for personnel safety. The explosimeter was on hand to monitor ambient air for potentially explosive vapors. The explosimeter functioned well during the field work and no explosive atmospheres were encountered.

3. Well Installation

Eight boreholes were drilled for installation of monitor wells at Sites 32 and 2. The boreholes were sampled at 5-foot intervals for stratigraphic purposes. Descriptions of the soils encountered were made in the field by the Dames & Moore geologist and recorded on field logs used to prepare the geologic logs for each boring. No samples from these borings were retained for testing. The casing installed for the monitor wells is a nominal 2-inch (2.375-inch O.D. by 2.067-inch I.D.) Schedule 40 PVC pipe and well screen. The screen has a 0.010-inch slot size with a 0.25-inch space between slots. There are three parallel rows of horizontal slots factory-sawed along the length of each screen. The bottom of the well is sealed with a short plug section. All pipe and screen sections were coupled with threaded joints; no PVC solvent or metal parts were used. The wells have 10 feet of screen installed so that the upper 2 feet of screen extends above the water table. Above the screen, blank casing is installed to a nominal 1 to 2 feet above the ground surface. The top of the well casing is sealed with a slip-on PVC cap. The construction details for the monitor wells are given in Table 3. The installation record for each well is provided in Appendix D.

The annular space from the bottom of the well to 2 feet above the screen was backfilled with bagged mason's or silica sand. A 2-foot bentonite plug was placed in the annulus above the sand and the remainder of the annulus was backfilled to the surface with a cement-bentonite grout mixture. A concrete cap (composed of sand and cement) was poured at the ground surface and sloped away from the well. The installation was completed by placing a 5-foot length of 6-inch diameter steel pipe with a lockable cap into the concrete pad and over the well pipe. The protective casing extends a nominal 2 to 3 feet above the ground surface. In some cases, 3-inch diameter steel guard posts were installed radially approximately 3 feet out from the well casing to provide additional protection for the well. The well covers were locked with identically keyed locks and the base Bioenvironmental Engineers (BEEs) and Civil Engineers (CEs) were provided with keys.

All of the wells were developed using a hand-operated 1.7-inch pump rated at 2.75 gallons per minute. The pump is constructed of PVC, stainless steel, and Buna N seals. The development procedure consisted of pumping the monitor well until the water flowing from the pump outlet became clear or until it became obvious that further effort was not going to improve the clarity of the water being discharged.

TABLE 3

MONITOR WELL CONSTRUCTION DETAILS
AND SURVEY DATA FOR WELLS AND BORINGS
EIELSON AFB
PHASE II, STAGES 1 AND 2

WELL NO.	EASTING	NORTHING	WELL COVER[a]	ELEV. TOP PVC PIPE[a]	ELEV. TOP GROUND[a]	DEPTH[b]	SCREENED INTERVAL[b] FROM	TO	WATER TABLE ELEVATION 06/84[a]	WATER TABLE ELEVATION 12/84[a]	WATER TABLE ELEVATION 09/86[a]
W-1	391561.9	226087.8	543.54	543.29	542.3	23	3	23	534.3	534.7	--
W-2	388957.9	223735.1	547.65	547.61	546.2	24	4	24	537.2	536.8	--
W-3	389238.8	221805.5	547.93	547.64	545.8	24	4	24	536.8	539.1	--
W-4	388616.1	228652.9	538.59	538.34	538.3	24	4	24	529.3	528.9	--
W-5	386758.8	227963.5	538.37	538.32	536.9	23	3	23	528.9	532.0	--
W-6	384876.6	227270.9	541.18	540.63	539.5	25	5	25	529.5	532.5	--
W-7	382409.6	239055.7	527.00	526.78	525.4	24	4	24	516.4	519.6	519.58
GW-32A	382791.7	238742.0	526.54	526.27	524.9	13	3	13	--	--	519.85
GW-32B	382417.9	239203.2	525.60	525.39	524.5	15	5	15	--	--	519.47
GW-32C	381903.6	239492.3	526.09	525.91	525.0	15	5	15	--	--	519.11
GW-32D	381350.2	239015.3	528.23	528.05	527.3	15	5	15	--	--	519.60
GW-32E	380933.9	239469.5	527.36	527.02	526.2	15	5	15	--	--	518.96
GW-32F	383232.7	236724.8	529.11	528.73	527.4	14.5	4.5	14.5	--	--	521.53
W-8	385609.1	239161.7	529.37	529.38	527.4	21	1	21	521.4	521.3	521.00
W-9	385874.2	239264.0	529.95	529.59	528.5	21	1	21	522.5	521.2	521.22
GW-2A	386146.0	238766.0	--	--	527.0	--	-	--	--	--	--
GW-2B	386134.6	238803.3	529.66	529.29	528.2	14.5	4.5	14.5	--	--	521.49
GW-2C	385316.5	239113.7	529.81	529.06	529.0	15.5	5.5	15.5	--	--	520.28
W-10	383691.0	223714.8	545.52	545.39	544.1	25	5	25	535.1	536.6	537.59
B-1A	383695.1	223701.9	--	--	544.3						
B-1B	383676.7	223710.8	--	--	544.4						
B-1C	383703.9	223717.8	--	--	544.4						
B-1D	383688.1	223726.5	--	--	544.4						

[a]Feet above mean sea level.

[b]Feet below ground surface.

4. Well Sampling

Prior to sample collection, each well was pumped continuously until three or more casing volumes of water had been removed. Following pumping, the wells were purged using a Teflon® bailer suspended from a monofilament nylon line dedicated to each well. Temperature, conductivity, and pH measurements of the water were made on consecutive samples from the well. The well was considered to have stabilized when three successive readings of the above parameters gave equivalent values. The forms used for the stabilization testing are included in Appendix E. Immediately following stabilization of the well, samples were collected with a bottom discharge Teflon® bailer and placed in prepared containers with appropriate preservatives. The samples were immediately stored on ice in insulated shipping containers. An exception to this procedure was made for Wells GW-32D and GW-32E since the temperature-salinity-conductivity meter failed during testing. These two wells were thoroughly pumped and bailed and were considered stabilized based on pH readings only. Temperature and conductivity measurements in these wells were made during a subsequent trip in November 1986. Certain wells were resampled in July, 1987, if the analyses conducted in 1986 did not meet required holding times.

At the end of each sampling day the water samples were shipped via counter-to-counter air courier service to the testing laboratories [UBTL in Salt Lake City, Utah, and USAF Occupational and Environmental Health Laboratory (OEHL) at Brooks AFB, Texas], where the samples were received the following day.

The pump, bailer, and the various probes and containers used during sampling and field testing were thoroughly cleaned and rinsed after each use. All field instruments were calibrated before and during use to ensure accuracy. Static water levels were measured during drilling operations and again during sampling.

Chain-of-custody forms were prepared and accompanied the samples from the field to the laboratory. These records document the integrity of the samples at each point of transfer, from field personnel to shippers to the laboratory staff. The signatures of the individuals relinquishing and accepting custody of the samples and the date and time appear on the records at each point of transfer (see Appendix G).

5. Hydraulic Test

A falling head or instant recharge test was conducted on Well GW-32F, in accordance with the scope of work and Technical Operations Plan (TOP), to determine the hydraulic conductivity of the surficial aquifer. The test consists of injecting a known volume or "slug" of water into a well and the decline in the induced water level is measured at a number of points over time until the induced level declines to the static water level. To conduct the test, a large funnel was placed in the top of the well casing and potable water was poured from 5 gallon buckets into the funnel and, hence, into the well. Prior to introducing the water, an electric water level indicator was lowered through the funnel to allow measurement of the static water level and water level elevations during the course of the test.

The hydraulic conductivity at this location is estimated to be on the order of 1.0×10^{1} cm/sec as the water level dropped more rapidly than could be measured with the instruments available on site. To confirm this estimate, the instant recharge test should be run again and coupled with a rising head test.

C. SAMPLING PROCEDURES AND REFERENCED METHODS

The ground water and soil samples were analyzed in accordance with U.S. Environmental Protection Agency (USEPA) methods. Table 1 presents the detailed listing of the analytical methods employed for the analysis of ground water and soil samples. Details of the analytical procedures are provided in Appendix F. The TOP, Appendix M, presents a description of field sampling procedures.

D. SAMPLING REPRESENTATION RELIABILITY AND INTEGRITY

1. Soil Sample Analyses

The soil samples taken at Site 1 to document possible pesticide contamination are believed to be representative of site conditions by virtue of placement of the borings and depth of the procured samples. The reliability and integrity of these samples was documented by the field and laboratory handling and analytical procedures. Although the field procedures did not strictly adhere to the SW 3550/8080 protocol, the protocol used on these samples was approved by USEPA Region 10 (see Appendix I and Section IV for additional information).

2. Ground Water Analyses

The majority of ground water quality analyses are considered to be reliable by virtue of the well construction and sampling procedures followed in the field to ensure that the samples were representative, by virtue of the quality control procedures in the laboratory, and because of the monitor well locations.

In the UBTL analytical report dated January 7, 1987, it was noted that several water sample analyses did not meet holding time requirements. Monitor wells were resampled in July, 1987, and analyzed for those parameters with elapsed holding times. The analytical results presented in Table 4 comprehend both the 1986 and 1987 samples and do meet required holding times.

IV. DISCUSSION OF RESULTS AND SIGNIFICANCE OF FINDINGS

This section presents a discussion of the chemical analyses of groundwater and soil samples collected during field investigations at three sites within Eielson AFB (Plate 2). This section also discusses the significance of these analytical results. Site specific geology and hydrogeology is discussed in Section II and the field investigations are described in Section III.

A. DISCUSSION OF RESULTS

As listed in Table 1, water samples were analyzed for purgeable halocarbons, purgeable aromatics, pesticides, petroleum hydrocarbons, TDS, lead, arsenic, cadmium, chromium, mercury, silver, TOC, total phosphate, and nitrate, nitrite. Ground water samples collected at all sites (32, 2, and 1) were analyzed for purgeable halocarbons, purgeable aromatics, petroleum hydrocarbons, TDS, and lead. Pesticides were analyzed at Site 1 only, while arsenic, cadmium, chromium, mercury, and silver were analyzed at Site 2 only. TOC, total phosphate, and nitrate, nitrite were analyzed at Site 32 only. Table 4 lists water quality analysis results above the limits of detection.

Soil samples at Site 1 were tested for pesticides (Table 1). Table 5 lists soil analysis results abov· the limits of detection.

1. Site 32

This site includes sampling locations relative to the sewage treatment plant spill ponds and the treated effluent leaching ponds.

Geophysical Survey

The extent of potential migration of contaminants from the waste treatment facility was investigated by geophysical means using electromagnetic (EM) terrain conductivity profiling. Eleven EM profile lines were established in the vicinity of the waste treatment facility. The locations of these lines in relation to the facility and the various ponds, lagoons, pits, etc. associated with the facility are shown on Plate 10. Lines 1 and 2 were located such that they extended through wooded areas after line-of-sight access was cleared with a small bulldozer. Lines 3 through 11 were located through open areas, primarily along roads and trails. The placement, orientation and length of each of the eleven EM lines are described in Table 6.

TABLE 4

ANALYTICAL RESULTS ABOVE DETECTION LIMITS
WATER SAMPLES
EIELSON AFB
IRP PHASE II STAGE 2

											SITE 1	
			SITE 2									
PARAMETER	UNIT	DETECTION LIMIT	PRIMARY DRINKING WATER STANDARD	SECONDARY DRINKING WATER STANDARD	GW-2B	GW-2C	W-8	W-9	TRIP BLANK TWO (W-8)	W-9(FOC) TWO	TRIP BLANK 09/15/86[c]	W-10
Trichlorofluoromethane	ug/L	0.44	N.E.[b]	N.E.	1.2	5.4	5.6	3.4	N.A.	N.A.	N.D.	3.0
Petroleum Hydrocarbons	mg/L	0.2	N.E.	N.E.	1.6	1.6	N.D.	1.8	N.A.	N.A.	1.4[d]	N.D.[e]
TDS	mg/L	10.	N.E.	500	170[e]	200[e]	200[e]	240[e]	14[e]	12[e]	N.D.	180[e]
Arsenic	mg/L	0.001	0.05	N.E.	8	5.	24.	9.	N.A.	N.A.	N.D.	N.A.
Cadmium	mg/L	0.004	0.010	N.E.	N.D.	9.	N.D.	4.	N.A.	N.A.	N.D.	N.A.
Temperature	°C	0.1	N.E.	N.E.	1.1	4.0	2.3	3.5	N.A.	N.A.	N.D.	6.8
pH	S.U.	0.1	N.E.	6.5-8.5	6.4	6.8	6.4	6.4	N.A.	N.A.	N.D.	7.6
Specific Conductivity	umhos/cm	10	N.E.	N.E.	221	167	357	341	N.A.	N.A.	N.D.	216

[a] A second column confirmation was performed
[b] Total Trihalomethanes = 100 ug/L
[c] Date received by UBTL
[d] Attributed to laboratory background
[e] Sampled July, 1987
N.A. = Not analyzed for this parameter
N.E. = No criterion established
N.D. = None detected

TABLE 4

ANALYTICAL RESULTS ABOVE DETECTION LIMITS
WATER SAMPLES
EIELSON AFB
IRP PHASE II STAGE 2

PARAMETER	UNIT	DETECTION LIMIT	PRIMARY DRINKING WATER STANDARD	SECONDARY DRINKING WATER STANDARD	SITE 32 GW-32A	GW-32B	GW-32B(FQC) 32	GW-32C	FIELD QC (GW-32C)	GW-32C(FQC) 32	GW-32D	GW-32E	GW-32F	W-7	TRIP BLANK 09/16/86[c]	TRIP BLANK 32 (GW32A)
1,1-Dichloroethane[a]	ug/L	0.49	N.E.	N.E.	N.D.	N.D.	N.A.	2.0	1.8	N.A.	0.74	0.63	N.D.	N.D.	N.D.	N.A.
trans-1,2-Dichloroethene	ug/L	0.42	N.E.	N.E.	N.D.	N.D.	N.A.	2.4	2.5	N.A.	N.D.	N.D.	N.D.	N.D.	N.D.	N.A.
Trichlorofluoromethane	ug/L	0.44	N.E.[b]	N.E.	21.	2.0	N.A.	9.0	4.4	N.A.	6.1	4.6	11.	8.7	N.D.	N.A.
Petroleum Hydrocarbons	mg/L	0.2	N.E.	N.E.	N.D.[e]	0.4[e]	0.2[e]	0.3[e]	0.6	N.A.	0.3[e]	N.D.	N.D.[e]	N.D.	0.5[d]	N.D.[e]
TDS	mg/L	10.	N.E.	500	210[e]	200[e]	N.A.	460[e]	480	470[e]	290[e]	320[e]	240[e]	330[e]	38[d]	N.A.
TOC	mg/L	1.	N.E.	N.E.	33.	110	N.A.	57.	75.	N.A.	26.	34.	19.	7.	N.D.	N.A.
Total Phosphate	mg/L	0.1	N.E.	N.E.	8.1	5.5	N.A.	4.5	4.7	N.A.	3.6	4.3	4.7	0.3	N.D.	N.A.
Nitrate, Nitrite	mg/L	0.01	10	N.E.	0.16	0.15	N.A.	0.22	0.50	N.A.	0.12	0.13	0.11	24.	N.A.	N.A.
Lead	mg/L	0.005	0.05	N.E.	0.006	N.D.	N.A.	N.D.	0.005	N.A.	N.D.	N.D.	N.D.	N.D.	N.D.	N.A.
Temperature	°C	0.1	N.E.	N.E.	5.2	5.2	N.A.	9.2	9.2	N.A.	4.2	4.0	6.2	7.5	N.D.	N.A.
pH	S.U.	0.1	N.E.	6.5-8.5	6.1	6.1	N.A.	6.5	6.5	N.A.	7.4	7.7	6.4	5.9	N.D.	N.A.
Specific conductivity	umhos/cm	10	N.E.	N.E.	320	585	N.A.	687	687	N.A.	589	606	371	539	N.D.	N.A.

[a] A second column confirmation was performed
[b] Total trihalomethanes = 100 ug/L
[c] Date received by UBTL
[d] Attributed to laboratory background
[e] Sampled July, 1987
N.A.: Not analyzed for this parameter
N.E.: No criteria established
N.D.: None detected

TABLE 5

ANALYTICAL RESULTS ABOVE DETECTION LIMITS*
SOIL SAMPLES - SITE 1
EIELSON AFB
IRP PHASE II STAGE 2

	Moisture (%)	4,4'-DDD (mg/kg)	4,4'-DDE (mg/kg)	4,4'-DDT (mg/kg)
DETECTION LIMIT	1.0	0.0002	0.0005	0.0005
Sample designation with depth in feet				
B1-A 0-1.5	6.9	0.002	0.004	0.008
B1-B 0-1.5	9.0	N.D.	0.003	0.005
B1-B 2.5-4	8.0	N.D.	0.001	0.001
B1-B 2.5-4 (duplicate)	8.7	N.D.	N.D.	0.003
B1-B 5-6.5	9.7	N.D.	0.002	0.002
B1-B 7.5-9	24.	N.D	N.D.	0.004
B1-B 7.5-9 (duplicate)	14.	N.D.	0.001	0.002
B1-C 0-1.5	5.9	0.003	0.001	0.002
B1-C 5-6.5	4.6	N.D.	N.D.	0.001
B1-C 7.5-9	17.	N.D.	0.001	0.005
B1-D 0-1.5	9.7	N.D.	N.D.	0.003
B1-D 2.5-4	5.6	N.D.	N.D.	0.001

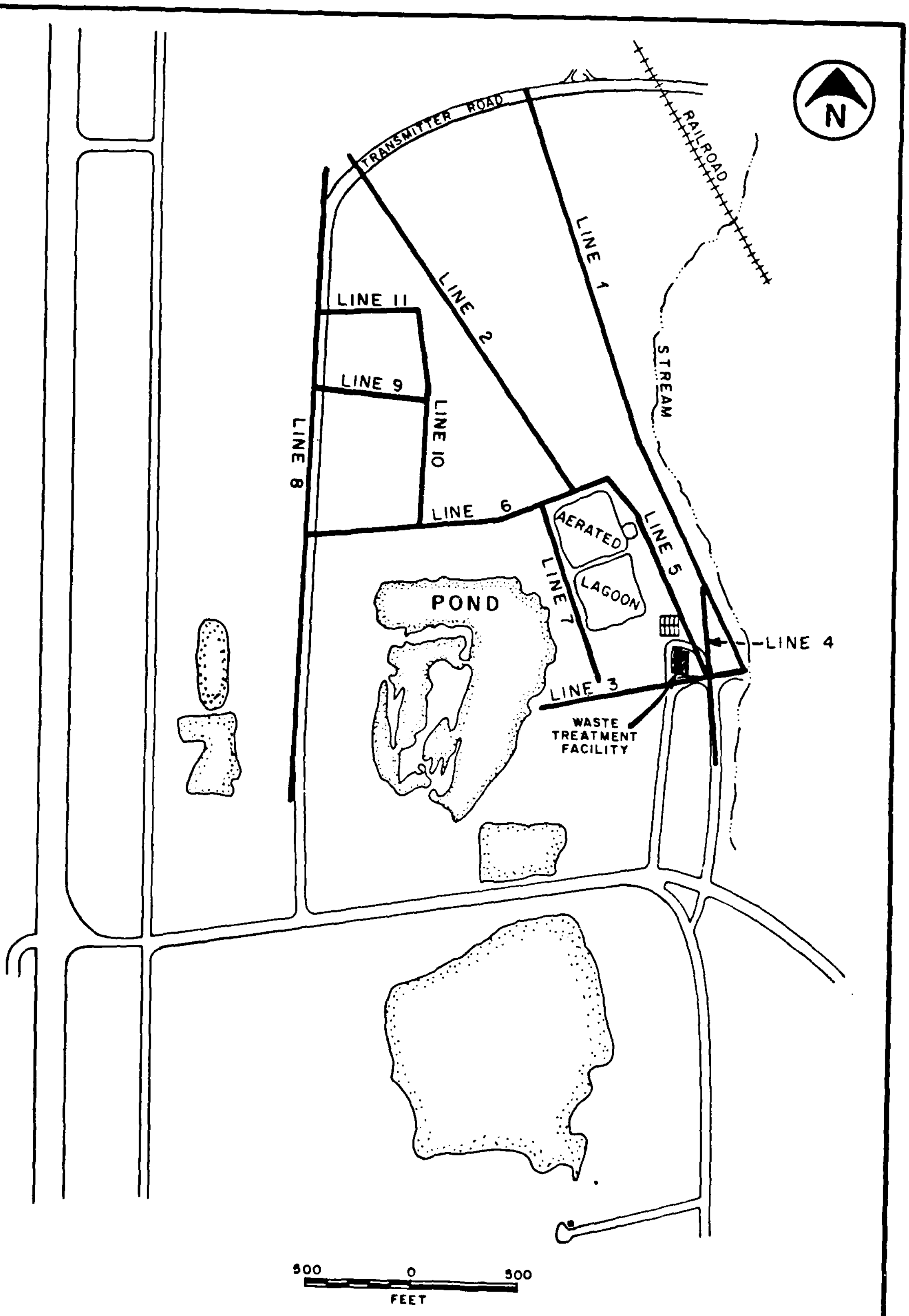
*Concentrations are on a dry weight basis.

N.D. = None detected.

TABLE 6

EM SURVEY LINE LOCATIONS

LINE NO.	GENERAL ORIENTATION	LOCATION	LENGTH
1	S - N	East of treatment facility, through woods to Transmitter Road	3075'
2	S - N	North end of aerated lagoon, through woods to Transmitter Road	1875'
3	E - W	South of treatment facility from stream to pond	990'
4	S - N	East of spill ponds	900'
5	S - N	Past Bldg. 2316, between sludge pits and spill ponds, along east side of aerated lagoons	1250'
6	E - W	Northeast corner of aerated lagoon to Transmitter Road	1500'
7	S - N	West of aerated lagoons	875'
8	S - N	West side of Transmitter Road, west of treatment facility	2900'
9	E - W	Woods northwest of treatment facility	525'
10	S - N	Woods northwest of treatment facility	1025'
11	E - W	Woods northwest of treatment facility	475'



EM GEOPHYSICAL SURVEY -
LINE LOCATION MAP

Dames & Moore

PLATE 10

Readings of terrain conductivity, expressed in millimhos per meter (also milliSiemens per meter), were obtained at 25-foot spacings along each line. Readings were made with the antenna boom oriented parallel to the direction of traverse. Notations of surface objects and/or conditions which might affect the conductivity readings were made during the course of the field measurements. Plates L-1 through L-18 in Appendix L present the terrain conductivity profile data for Lines 1 through 11 along with comments regarding line intersections and surface features.

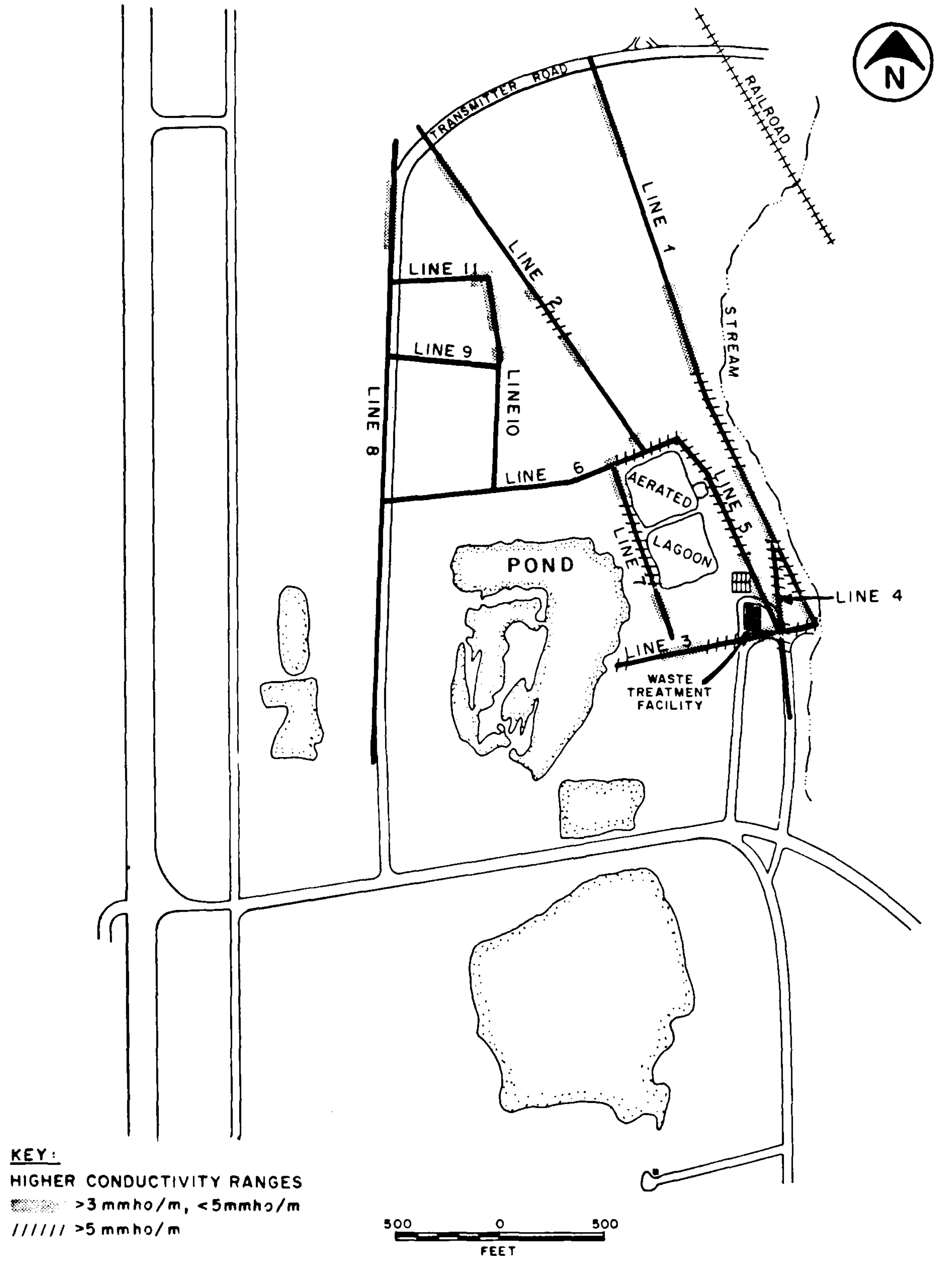
Among some of the factors which affect terrain conductivity are:

- soil type
- soil moisture content
- depth to water table
- electrolytes in the ground water
- surficial ground cover
- extraneous conductive objects (fences, pipelines, culverts, buildings, etc.)
- electrical interference (power lines).

In evaluating profile data, the above factors must be considered in attempting to determine whether high conductivities are attributable to the presence of contaminants or to some other source. As the data obtained in this study represent indirect measurements, the interpretation of the data as to origin represent inferred conditions.

After examining the conductivity profiles, it was noted that in areas remote from the treatment facility the conductivity was generally less than 5 millimhos per meter and usually less than 3 millimhos per meter. Portions of the profiles where the conductivity exceed the 3 and 5 millimhos per meter levels are marked on Plates L-1 through L-18 (presented in Appendix L), and these locations are noted on Plate 11 to indicate their position relative to the treatment facility. These "threshold" values are not intended as definitive markers of contaminant presence, but serve rather as convenient indicators of possible anomalous conditions.

Discounting those readings which are affected by known utilities, it appears the locations which likely show elevated conductivities due to contaminant presence are restricted primarily to the immediate area of the



EM GEOPHYSICAL SURVEY -
AREAS OF HIGH CONDUCTIVITY

Dames & Moore

PLATE 11

treatment facility. The highest conductivities were observed near the northwest corner of the aerated lagoons (Lines 2 and 6), to the south and west of the aerated lagoons (Line 7) and immediately to the north of the two concrete box culverts which extend from the treatment facility towards the stream on the east (Lines 1 and 4). Of particular note in the above is the character of the data on Line 2 which extends away from the aerated lagoons. Within a distance of less than 100 feet north of the steel interceptor culvert, the conductivities drop back to what appears to be a background level.

The sharply higher conductivities seen on Line 3 from station -300 to -525 may represent a utility run and/or overhead power lines. This anomaly could, however, be an indication of the presence of contaminant, possibly along a utility run.

The final locations to which comment is addressed are those near the north ends of Lines 1 and 2 and near the intersection of Lines 10 and 11. These locations are marked by evidence of abandoned structures and/or earlier occupation and are indicated on the profiles by slightly higher conductivities.

A summary of the segments of the EM profiles which are marked by elevated conductivity values is presented in Table 7.

Ground Water Analysis

Seven wells were sampled for water quality analyses. One of these wells (W-7) was installed during the Phase II, Stage 1 investigation, and is located downgradient of the spill ponds and sewage sludge drying containments (Plate 7). The remaining six wells were installed during Stage 2 and include GW-32A and GW-32F upgradient of the site, GW-32B and GW-32C downgradient of the site in areas of high conductivity, and GW-32D and GW-32E downgradient of the treated effluent leaching ponds. Water quality analysis results from all wells indicated some degree of groundwater contamination.

Concentrations of trichlorofluoromethane were detected in several ground water samples and a trip blank collected from or associated with Eielson AFB, the DEW Line Stations, and Elmendorf AFB. Resampling at one location on Elmendorf did not confirm the presence of this parameter and the trip blank was also clean. It is believed the presence of trichlorofluoromethane in the Stage 2 analyses may be the result of either laboratory or trip contamination. Although the analytical results for this substance are not confirmed, they will be reported as received from the laboratory in the interest of providing a complete report.

TABLE 7

LOCATIONS OF ELEVATED TERRAIN CONDUCTIVITY

LINE NO.	STATIONS	REMARKS
1	150 - 450	Moderately high
	875 - 1375	High
	2575 - 2950	Minor
2	0 - 75	Very high
	500 - 950	Possible elevation effect
	1500 - 1800	Minor
3	-25 - -150	Minor
	-350 - -525	Questionable origin
4	350 - 575	High
5	100 - 150	Moderately high
	250 - 1250	Moderately high to high
6	0 - -350	Very high
7	0 - 100	High
	225 - 750	Moderately high
8	2475 - 2825	Possible elevation effect
9	-	None
10	625 - 700	Minor
	800 - 1000	Minor
11	-25 - -125	Minor

Water quality analysis results of samples presumed to be background (GW-32A and GW-32F) revealed elevated concentrations of trichlorofluoromethane at 21 ug/L and 11 ug/L, respectively. Purgeable aromatics as well as petroleum hydrocarbons were below detection limits at both of these upgradient wells. A lead concentration of 0.006 mg/L was found at GW-32A which was slightly above the 0.005 mg/L detection limit. TOC, total phosphate, and nitrate, nitrite concentrations were slightly elevated at both upgradient sampling locations. Concentrations of these parameters at GW-32A were 33 mg/L, 8.1 mg/L, and 0.16 mg/L, respectively while concentrations at GW-32F were 19 mg/L, 4.7 mg/L, and 0.11 mg/L, respectively. The pH in wells GW-32A (6.1) and GW-32F (6.4) were slightly more acid than permitted by the secondary drinking water standard (SDWS). However, no background ground water data is available for comparison.

Wells downgradient of the site and in areas of relatively high conductivity (GW-32B and GW-32C), generally exhibited an elevated level of trichlorofluoromethane. Trichlorofluoromethane was reported at 2.9 ug/L in well GW-32B and 9.0 ug/L in well GW-32C, while 1,1-dichloroethane and trans-1,2- dichloroethene were detected in well GW-32C at concentrations of 2.0 ug/L and 2.4 ug/L, respectively. Purgeable aromatics and lead were not detected in either well downgradient of the site. Petroleum hydrocarbons were detected in GW-32B at 0.4 mg/L and at 0.3 mg/L in GW-32C. TOC, total phosphate and nitrate, nitrite were slightly elevated at both wells. The TOC concentration was 110 mg/L at GW-32B and 57 mg/L at GW-32C. Total phosphate concentrations were 5.5 mg/L at GW-32B and 4.5 mg/L at GW-32C while nitrate, nitrite concentrations were 0.15 mg/L and 0.22 mg/L, respectively. TDS concentrations were 200 mg/L at GW-32B and 460 mg/L at GW-32C. GW-32B had a pH of 6.1, exceeding the SDWS.

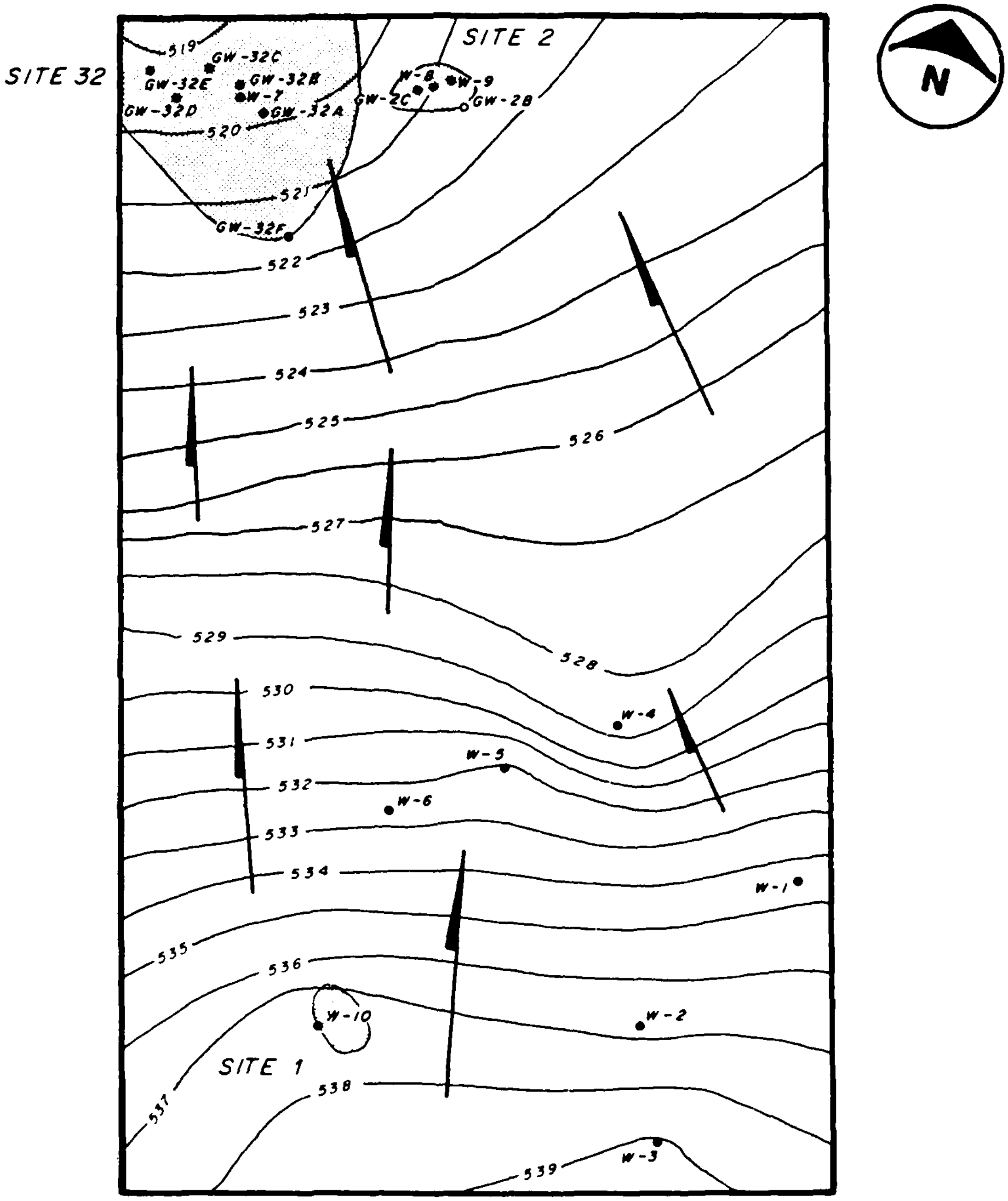
Both wells which were installed downgradient of the treated effluent leaching ponds exhibited detectable concentrations of 1,1-dichloroethane and trichlorofluoromethane. At both GW-32D (0.74 ug/L) and GW-32E (0.63 ug/L) 1,1-dichloroethane was found slightly above the detection limit of 0.49 ug/L. Trichlorofluoromethane concentrations were reported at GW-32D (6.1 ug/L) and GW-32E (4.6 ug/L). TOC concentrations were 26. mg/L at GW-32D and 34. mg/L at GW-32E. Total phosphate in GW-32D and GW-32E was slightly elevated at 3.6 mg/L and 4.3 mg/L, respectively, while nitrate, nitrite was also present at 0.12 mg/L and 0.13 mg/L, respectively. TDS concentrations were 290 mg/L at GW-32D and 320 mg/L at GW-32E. Petroleum hydrocarbons were detected in GW-32D at a concentration of 0.3 mg/L. Concentrations of this parameter was not detected in GW-32E, however. Lead was absent in both GW-32D and GW-32E.

The existing well (W-7), downgradient of the spill ponds and drying beds, exhibited elevated levels of trichlorofluoromethane (8.7 ug/L) and nitrate, nitrite (24 mg/L). TOC concentration was low at 7 mg/L. TDS concentrations were measured at 330 mg/L. Purgeable aromatics, petroleum hydrocarbons, and lead were all below the detection limits in well W-7. The pH of 5.9 in W-7 exceeded the SDWS. Stage 1 sampling and analysis results also indicated ground water contamination in this well. TOX, oil and grease, and specific conductance levels were elevated while lead, phenols, and PCBs were below detection limits.

Plate 12 is a ground water contour map of the three sites investigated during Phase II, Stage 2; Plate 13 is a three dimensional representation of the same data presented as a ground water contour map. The ground water gradient at Site 32 illustrated on these plates is slightly west of north at approximately 4.5 feet per mile.

2. Site 2

During Phase II, Stage 2, one monitor well, GW-2B, was installed upgradient of an inactive base landfill (used from 1960-1967) and one monitor well (GW-2C) was installed downgradient of the landfill. Water quality analyses from wells GW-2B and GW-2C (Table 4), in addition to wells W-8 and W-9, both of which were installed downgradient of the landfill during Stage 1, indicate limited ground water contamination. However, no background ground water data is available for comparison. The pH in wells GW-2B, W-8, and W-9 was 6.4, slightly exceeding the SDWS. Arsenic concentrations measured during Stage 2 exceeded the primary drinking water standard (PDWS) of 0.05 mg/L in all four wells (GW-2B, 8. mg/L; GW-2C, 5. mg/L; W-8, 24. mg/L; and W-9, 9. mg/L). Cadmium in GW-2C, at 9. mg/L, and in W-9, at 4. mg/L, exceeded the PDWS of 0.01 mg/L. Cadmium in GW-2B and W-8 was below the detection limit of 0.004 mg/L. Trichlorofluoromethane was reported by the laboratory at a concentration of 1.2 ug/L at GW-2B, 5.4 ug/L at GW-2C, 5.6 ug/L at W-8, and 3.4 ug/L at W-9. Stage 1 water quality results indicated a lead concentration, in W-8, of 0.06 mg/L which exceeded the PDWS of 0.05 mg/L. In contrast, Stage 2 water quality results indicated that lead was below the detection limit of 0.005 mg/L at all four Site 2 wells. Petroleum hydrocarbon concentrations were above levels of detection in wells GW-2B, GW-2C, and W-9 at 1.6 mg/L, 1.6 mg/L, and 1.8 mg/L, respectively, and below the level of detection at W-8. TOX concentrations during Stage 1 were elevated at W-8 (100 ug/L) and W-9 (110 ug/L). During Stage 2 water quality analysis, all purgeable halocarbons (excluding trichlorofluoromethane which has not been confirmed), purgeable aromatics, lead, chromium, mercury, and silver were below the respective levels of detection.



KEY:

°W-8 MONITOR WELL INSTALLED DURING PHASE II, STAGE 1.

°GW-2C MONITOR WELL INSTALLED DURING PHASE II, STAGE 2.

—521— CONTOUR INTERVAL (1 FOOT).

INDICATES GROUND WATER FLOW DIRECTION.

SITE NUMBERS AND AREA MONITORED

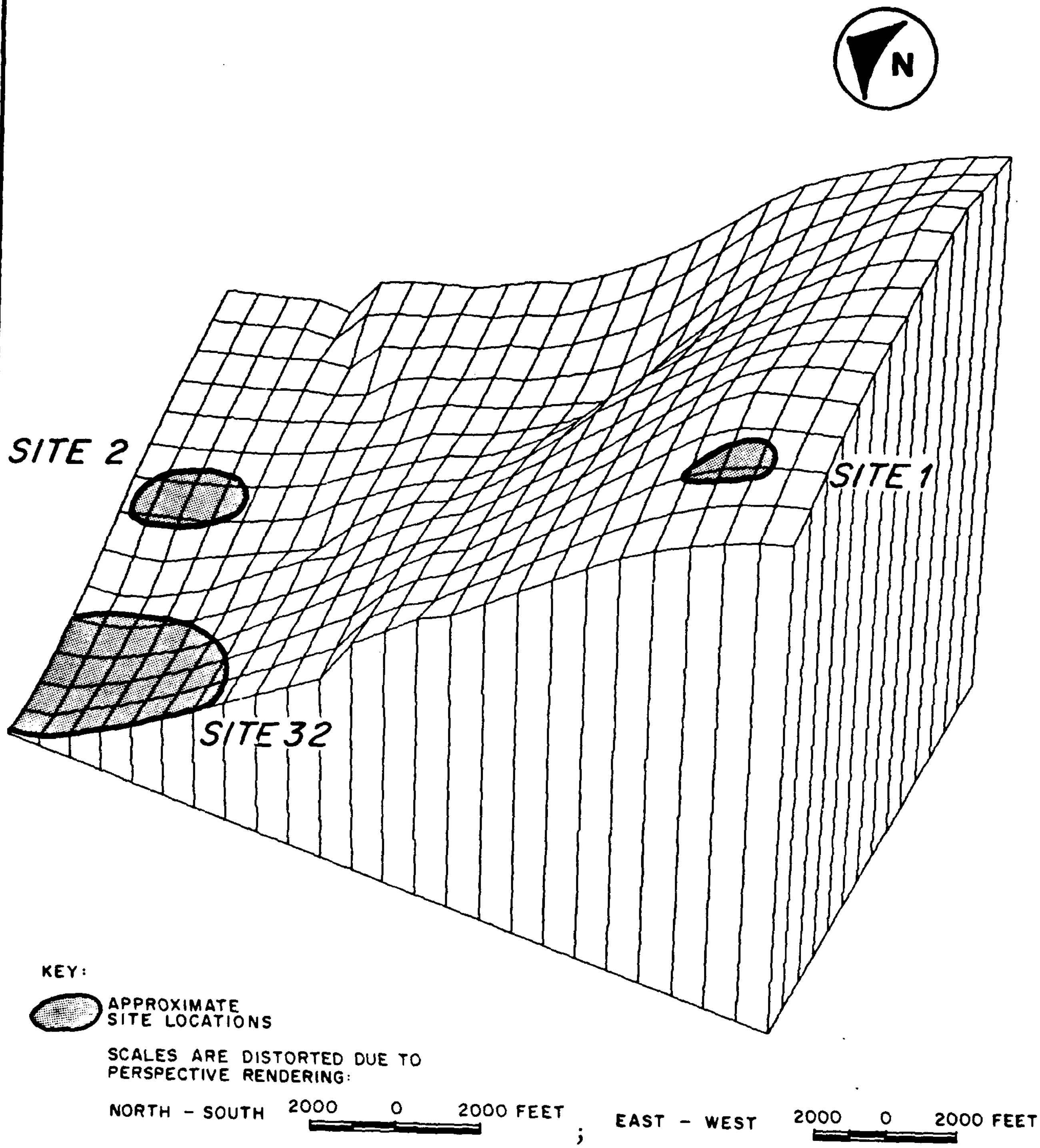
SITE 1

2000 0 2000 FEET

GROUND WATER CONTOUR MAP - EIELSON AFB, ALASKA

Dames & Moore

PLATE 12



GROUND WATER CONTOUR
RELIEF MAP - EIELSON AFB, ALASKA

Dames & Moore

PLATE 13

The ground water gradient at this site is approximately 4 feet per mile to the northwest (Plates 12 and 13).

3. Site 1

During Phase II, Stage 1, one monitor well (W-10) was completed downgradient of an old base landfill which was in operation from 1950 to 1960. Well W-10 was resampled during Phase II, Stage 2, and results of water quality analyses indicate that trichlorofluoromethane (3.0 ug/L) and TDS (180 mg/L), were found above detection limits. All remaining purgeable halocarbons, purgeable aromatics, petroleum hydrocarbons, and pesticides in addition to lead were below detection limits. Stage 1 water quality analysis results indicated TOX, lead, and oil and grease at levels of 89 ug/L, 0.02 mg/L, and 2.0 mg/L, respectively, while TOC was very low, and phenols and PCBs were below detection limits. Measurements of both specific conductance and pH were near assumed background levels during Stage 1 investigations. Stage 1 and Stage 2 water quality analysis indicate little contamination in W-10.

The ground water gradient at Site 1 is approximately 20° west of north at 5 feet per mile (Plates 12 and 13).

Eighteen soil samples from four borings drilled to a total depth of 9 feet at Site 1 were analyzed for pesticides and percent moisture. Detectable levels of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were found in twelve of the samples ranging in concentration from 0.001 to 0.008 mg/kg (Table 5). Only two borings B1-A at a depth of 0 to 1.5 feet and B1-C at a depth of 0 to 1.5 feet had concentrations of 4,4'-DDD (0.002 mg/kg and 0.003 mg/kg, respectively). Concentrations of 4,4'-DDE in seven samples ranged from 0.001 mg/kg in borings B1-B and B1-C to 0.004 mg/kg in B1-A at 0 to 1.5 feet. Twelve soil samples contained concentrations of 4,4'-DDT above the detection limit. These concentrations ranged from a low of 0.001 mg/kg in three samples to a high of 0.008 mg/kg in sample B1-A at a depth of 0 to 1.5 feet. Two borings, B1-B and B1-C, had detectable levels of 4,4'-DDT at the 7.5 to 9 foot depth interval.

4. Reliability of Ground Water and Soil Analysis

The majority of the ground water quality analyses are considered to be reliable by virtue of the well construction and sampling procedures followed in the field to ensure that the samples are representative, by virtue of quality control procedures in the laboratory, and because of the monitor well locations.

The monitor wells were screened above and below the water table where low density organic contaminants would be concentrated. After the monitor wells were installed, they were thoroughly developed by pumping to remove effects of drilling and installation and to improve the flow of ground water into the wells. Pumping was continued until the discharge was clear of sediment. At least three casing volumes of water were purged from the monitor wells prior to sampling to ensure that the samples were representative of ground water in the formation. The monitor well samples were collected with a Teflon® bailer equipped with a bottom discharging device to minimize agitation and consequent aeration of the sample, which could volatilize organic chemicals.

The downgradient monitor wells were installed at locations where it was assumed they would most likely intercept ground water transporting contaminants from the waste or spill sites. That is, they are located either near the edge of the waste or spill as practicable in an area believed to be downgradient of the site or in areas of high conductivity as determined by the geophysical survey.

The upgradient wells were located in areas assumed to be removed from the influence of the site under question.

A lapse in holding time for pesticides analysis of soils occurred. Appendix I contains correspondence with Region 10 USEPA officials regarding the validity of the soil data and the acceptance of the handling procedures. For this reason, it is believed that the pesticide analyses of soils has produced valid data.

The laboratory quality control (QC) program is described in Appendix F. In general, analyses of duplicate and spiked samples were satisfactory. Details of the gas chromatographic columns are presented in the transmittal letter from UBTL in Appendix H.

The presence of trichlorofluoromethane in a number of ground water samples cannot be categorically ascribed to site contamination. To the best of their knowledge, the laboratory does not use trichlorofluoromethane at their facility. However, the possibility that the presence of this chemical may be due to an unknown laboratory source or contamination during transport cannot be ruled out. Neither trip blank accompanying the Eielson Stage 2 samples contained this parameter, but it was found in samples and a trip blank from Elmendorf AFB and the DEW Line Stations. Resampling at one location on Elmendorf did not confirm the presence of trichlorofluoromethane. At present, the source of trichlorofluoromethane is in question.

Two exceptions to the acceptable recovery of spike samples are noted in the QC data. Low recovery of DDT in spiked soil samples is attributed to conversion of DDT to DDD and DDE in the soil sample matrix or on the gas chromatographic column. This hypothesis is supported by spike soil samples showing elevated levels of DDD and DDE even though only DDT was spiked. Although the DDT spike recoveries from soil are low (27 and 43 percent), they are within the range of 23 to 134 percent allowed by UBTL's EPA Contract Laboratory Program contract. Low recoveries were obtained for the lead spikes in water samples from Sites 32 and 1. This factor is attributed to a matrix effect. Because the lead results were near or below the limit of detection, the method of standard additions -- normally employed to clarify matrix effects -- was not performed.

5. Background Concentrations

In an attempt to determine background concentrations for the parameters tested for at Eielson AFB, two wells (GW-32A and GW-32F) were established upgradient of Site 32 and one well (GW-2B) was established upgradient of Site 2.

The water quality analyses revealed concentrations of man-made organic compounds (trichlorofluoromethane and petroleum hydrocarbons) that suggest that these wells do not represent true background conditions but only represent conditions of ground water quality presumably unaffected by each of the respective sites. Plate 12, a ground water contour map of the three sites investigated during Stage 2 and Plate 13, a three dimensional representation of the same data, illustrates that Sites 32 and 2 are downgradient of the fuel saturated area (see Plate 2, wells W-1 through W-6) which may have contributed in part to the water quality monitored in the upgradient wells GW-32A, GW-32F, and GW-2B.

Several qualified assumptions can be made regarding background concentrations. Purgeable halocarbons were not found in all wells and were found only in relatively low concentrations when present. Petroleum hydrocarbons also were sporadically identified in several of the ground water samples. As these materials would not be expected to occur naturally in this hydrogeologic environment, any concentrations of these materials would be considered above "ambient" or "background" levels. Similarly, cadmium and lead were found to be below detection in at least half of the wells tested for these parameters, and it is assumed that these metals should be present only at concentrations below the limit of detection. Although arsenic may be present naturally in areas draining mountainous terrain, concentrations that are two orders of magnitude higher than the PDWS are assumed to be above an unknown normal ambient level.

The remaining two parameters, total phosphate and nitrate, nitrite, are assumed to be at background levels in well GW-32F whicn is located upgradient of Site 32. Phosphate concentration is at 4.7 mg/L and nitrate, nitrite is at 0.11 mg/L.

B. SIGNIFICANCE OF FINDINGS

Based on the results described in the previous section and on the hydrogeology described in Section II, this section will present an estimate, to the degree possible, of the extent of contamination at each site and the risk, if any, to human health that contamination poses. Human health would be threatened if any area water supply wells were in danger of being contaminated.

1. Extent of Contamination at Site 32

Ground water analyses from W-7 during both Stage 1 and Stage 2 indicate water quality is degraded immediately downgradient of the spill ponds and drying beds. TOC, TOX, specific conductance, and oil and grease were elevated at this site during Stage 1 while nitrate, nitrite concentrations were elevated during Stage 2. The proximity of W-7 to Base Well 12 suggests that this water supply well may also be contaminated.

Ground water analyses from GW-32D and GW-32E indicate water quality is degraded at the treated effluent leaching ponds and 1,1-dichloroethane, TOC, nitrate, nitrite, and phosphate were elevated. According to the hydrogeology of this site, this contamination should not affect Base Well 12. However, flow directions indicate off base water supply wells, especially in the community of Moose Creek, could be affected by this contamination.

Ground water analyses from well GW-32B and GW-32C also indicate water quality degradation downgradient of the general area of the treated effluent leaching ponds and the spill ponds and drying beds. Trichlorofluoromethane, 1,1-dicloroethane, trans-1,2-dichloroethene, TOC, total phosphate, nitrate, nitrite, and petroleum hydrocarbons were elevated in these wells. Base Well 12 should not be affected by this contamination; however, off base water supply wells downgradient of this site, especially in the community of Moose Creek, could be affected.

2. Extent of Contamination at Site 2

The PDWS for lead was exceeded at this inactive base landfill in W-8 during the Stage 1 investigation. In contrast, lead was not detected at any of the four wells (including W-8) during the Stage 2 investigation. However, TOC, TOX, specific conductance, and oil and grease were elevated during Stage 1 while petroleum hydrocarbons were found at elevated concentrations during Stage 2. Furthermore, PDWS for both arsenic and cadmium were exceeded downgradient of the site. The PDWS for arsenic was exceeded upgradient of the site. These elevated concentrations indicate ground water degradation at this inactive base landfill. No base water supply wells are downgradient from this site, but it is possible that off base wells, especially in Moose Creek could be affected by the contamination from this site.

3. Extent of Contamination at Site 1

No PDWS were exceeded during Stage 1 or Stage 2 investigations in W-10 at this inactive base landfill. Overall water quality at this site, with the exception of petroleum hydrocarbons, did not exhibit unusual concentrations of constituents. Contamination of soils by the pesticide DDT was found at this site during the Stage 1 investigation and further verified during the Stage 2 investigations when levels of DDD, DDE, and DDT were detected in the soils. DDT was detected in each of the four borings, and in borings B1-B and B1-C to a depth of 9 feet. The concentrations of DDD, DDE, and DDT were low but were in the general range of an order of magnitude higher than the detection limit for the individual parameters. Water was encountered at depths ranging from 7.0 feet to 9.0 feet throughout the four borings. No pesticides were detected in water samples obtained from W-10 during the Stage 2 investigation.

V. ALTERNATIVE MEASURES

This section presents several alternatives considered for further action regarding the environmental contamination and potential for human health hazards at Eielson AFB. The alternatives include further site investigation with the installation of additional monitor wells and the establishment of a ground water monitoring program.

The results of the Phase II, Stage 2 investigation confirm the conclusions of the Stage 1 study regarding the existence of ground water contamination at Sites 32 and 2 and soil contamination at Site 1. However, the levels of contamination are generally low and the location of the contaminants within the ground water regime does not appear to be immediately threatening to on-base or off-base potable wells.

To monitor the potential for migration of contaminants off of the base, additional monitor wells should be installed along the northern base boundary, north and downgradient of Sites 32 and 2. Analysis of ground water samples collected over time from these wells and from the wells in the vicinity of Sites 32 and 2 will provide data regarding the potential for off-base migration toward the community of Moose Creek, aquifer attenuation characteristics, and the impacts to the ground water chemistry generated from the remedial activities in the fuel saturated area. Most importantly, the discovery of contamination in the monitor wells along the northern base boundary could result in the lead time necessary to avert or remedy contamination in off-base water supply wells.

A ground water monitoring program should be designed that would include the analyses of petroleum hydrocarbons and TDS from Sites 32, 2, and 1 monitor wells since holding times for these parameters was exceeded in the Phase II, Stage 2 study. The samples should also be analyzed for trichlorofluoromethane since the presence of this parameter is questionable. Water samples from the new monitor wells at the northern base boundary should also be analyzed for these parameters, since the presence of petroleum hydrocarbons, in particular, would be indicative of contamination from the fuel saturated area.

The concentrations of arsenic and cadmium at Site 2 are unresolved as to source. These metals should be analyzed in water samples collected from all the wells at the three sites and the proposed new wells to determine if these concentrations are typical for this area or result from site contamination.

The results of the Phase II, Stage 2 investigation support that pesticides are not leached out of the soils at Site 1 in sufficient concentrations to be detected in the ground water. Therefore, the monitoring program will not include further pesticide analysis.

The concentrations of lead found at Site 2 are below the PDWS and are not considered significant. The nutrients phosphate and nitrate, nitrite result from incomplete waste water treatment at the Site 32 sewage treatment plant. The presence of these parameters is assumed to be a local condition with minimal potential health hazard.

Low concentrations of 1,1-dichloroethane and/or trans-1,2-dichloroethane were found in only three Site 32 wells. Additional monitoring for these parameters does not appear warranted.

Finally, the sampling proposed above may be conducted during periods of high and low ground water flow. Such a program may be run for several years to monitor changes in ground water chemistry as remediation is implemented in the fuel saturated area.

VI. RECOMMENDATIONS

The recommendations presented in this section have 3 primary purposes:

1. To identify those sites where further action is deemed warranted;

2. To confirm the existence and magnitude of contamination beneath the base identified during Phase II, Stage 2 investigations; and

3. To aid in establishing the distance of migration of contaminants under and off the base.

Various alternative measures for achieving these purposes, along with a discussion of the information that would be obtained, are presented in Section V. The following are our recommendations for the sites requiring further investigations.

A. SITES WHERE FURTHER ACTIONS ARE DEEMED UNWARRANTED (CATEGORY 1)

Based on efforts expended during this field survey, there are no sites which can be placed in Category 1.

B. SITES WARRANTING FURTHER INVESTIGATION (CATEGORY 2)

1. General Investigations at Sites 32, 2, and 1

Concentrations of arsenic (USEPA Method 206.2) and cadmium (USEPA Method 200.7) at Site 2 wells indicates that these analyses should be confirmed by another round of analyses. During this sampling event, these metals should also be analyzed at the other monitor wells to determine if such metal concentrations are due to ambient conditions or can be ascribed to conditions at Site 2. Also, trichlorofluoromethane (USEPA Method 601) should be reanalyzed to see if the analyses from this stage can be confirmed, and are in fact a reflection of base conditions or are a result of laboratory background. It is also recommended that the slug test be performed again and coupled with a rising head test to obtain a more definitive idea as to hydraulic conductivity for the surficial soils at this site.

A general review of potable base water well data should be performed in light of the data obtained from the Stage 2 effort. In particular, indicator parameters (such as pH, temperature, and specific conductivity), and parameters of concern (such as petroleum hydrocarbons, and arsenic and cadmium), should be studied.

2. Site 32

To safeguard water supplies downgradient of the base, a system of three to four monitor wells is recommended to be installed downgradient of Site 32 and near the base boundary. Because a significant quantity of ground water flows under the base, the actual impact by Site 32 and the remainder of the base can best be assessed by monitoring ground water immediately as it exits the base premises. This system of wells, constructed similarly to the Stage 2 wells, will serve as an early warning system for off-base ground water users.

3. Stage 2 Monitor Wells and New Monitor Wells

A sampling program should be established at a selected number of Stage 2 wells (monitor wells W-10, W-9, W-8, GW-2B, GW-2C, W-7, GW-32B) and the as-yet-to-be installed boundary wells. It is recommended that these wells be tested for petroleum hydrocarbons, indicator parameters (pH, temperature, and specific conductivity) and arsenic and cadmium if these metals are found to be at concentrations exceeding the PDWS during the resampling event during this stage. As remediation is occurring as a Phase IV effort in the fuel saturated area, a semi-annual sampling plan will document the effects of this effort on ground water quality.

APPENDIX A

DEFINITIONS, NOMENCLATURE, AND UNITS OF MEASUREMENT

DEFINITIONS, NOMENCLATURE, AND UNITS OF MEASUREMENT

AAC	Alaskan Air Command
adsorption	Adherence of gas molecules or of ions or molecules in solutions to the surfaces of solids with which they are in contact.
AFB	Air Force Base
alluvium	Unconsolidated sediments deposited during comparatively recent geologic time by a stream or other body of running water.
alluvial fan	Alluvial material deposited as a cone or fan at the base of a mountain slope.
aquifer	A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.
aquiclude	A body of relatively impermeable rock that is capable of absorbing water slowly but functions as an upper or lower boundary of an aquifer and does not transmit ground water rapidly enough to supply a well or spring.
aquitard	A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.
aromatic	Designating cyclic organic compounds characterized by a high degree of stability in spite of their apparent unsaturated bonds and best exemplified by benzene and related structures, but also evident in other compounds.
artesian	Ground water confined under hydrostatic pressure.
as N	As weight of nitrogen
AVGAS	Aviation gasoline
BEE	Bioenvironmental Engineer
CE	Civil Engineer
°C	Degree(s) Centigrade
cm/sec	Centimeter(s) per second
conductivity	A measure of the ability of a solution to carry an electric current, which is dependent upon the presence of ions in the water.
cone of depression	A depression in the potentiometric surface of a body of water that has the shape of an inverted cone and develops around a well from which water is being withdrawn.

conglomerate	The consolidated equivalent of gravel, both in size range and in the essential roundness and sorting of its constituent particles.
Cretaceous	A period of geologic time thought to have covered the span between 144 and 66.4 million years ago. Also, the corresponding system of rocks.
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DESEP	Civil Engineering/Environmental Planning
Devonian	A period of geologic time thought to have covered the span between 408 and 360 million years ago. Also, the corresponding system of rocks.
DOD	Department of Defense
downgradient	In the direction of decreasing hydraulic static head; the direction in which ground water flows.
DPDO	Defense Property Disposal Office
drawdown	The difference between the height of the water table and that of the water in a well; reduction of the pressure head as a result of the withdrawal of free water. Also called <u>cone of depression</u>.
effluent	A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.
EM	Electromagnetic
°F	Degree(s) Fahrenheit
fluvial	Of or pertaining to rivers; produced by the action of a stream or river.
FSI	Felec Services, Inc.
ft	Foot, feet
glaciofluvial outwash plain	A broad, outspread, flat or gently sloping alluvial sheet of stratified detritus (chiefly sand and gravel) removed from a glacier by meltwater streams and deposited in front of the margin of an active glacier.
gpd/ft	Gallon(s) per day per foot
gpm	Gallon(s) per minute
HARM	Hazard Assessment Rating Methodology

HNU	A type of photoionization detector for measurement of organic vapors
hydraulic gradient	In an aquifer, the rate of change of pressure head per unit of distance of flow at a given point and in a given direction.
in.	Inch(es)
IRP	Installation Restoration Program
Jurassic	A period of geologic time thought to have covered the span between 208 and 144 million years ago. Also, the corresponding system of rocks.
LEL	Lower explosive limit
Mesozoic Age	A period of geologic time thought to have covered the span between 245 and 66.4 million years ago; includes the Triassic, Jurassic, and Cretaceous periods. Also, the corresponding system of rocks.
metamorphic	Rocks that have undergone mineralogical and structural adjustment to physical and chemical conditions that have been imposed at depth, below the surface zones of weathering and cementation, and that differ from the conditions under which the rocks in question originated.
mg/g	Milligram(s) per gram
mg/L	Milligram(s) per liter
ml	Milliliter(s)
µg/g	Microgram(s) per gram
µg/L	Microgram(s) per liter
MOGAS	Motor gasoline
monitor well	A well used to measure ground water levels and to obtain samples.
msl	Mean sea level
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
OEHL/TS	Occupational and Environmental Health Laboratory/Technical Services
orthogonal	Pertaining to or composed of mutually right angles.

pH Negative logarithm of hydrogen ion concentration; measurement of acids and bases.

PCB(s) Polychlorinated biphenyl(s); highly toxic to aquatic life; PCBs persist in the environment for long periods of time and are biologically accumulative.

PDWS Primary drinking water standard(s)

percolation Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

permafrost Any soil, subsoil, or other surficial deposit, or even bedrock, occurring in arctic or subarctic regions at a variable depth beneath the earth's surface in which a temperature below freezing has existed continuously for 2 years to tens of thousands of years.

permeability The property or capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

phenols Any of various acidic compounds analogous to phenol and regarded as hydroxyl derivatives of aromatic hydrocarbons.

Pleistocene An epoch of geologic time thought to have covered the span between 1.6 million and 10,000 years ago.

POL Petroleum, oil and lubricants

porosity The property of a rock, soil, or other material of containing interstices.

potentiometric surface An imaginary surface representing the static head of ground water and defined by the level to which water will rise in a well.

ppm Part(s) per million

Precambrian Age Geologic time before the beginning of the Paleozoic; it is equivalent to about 90 percent of geologic time and ended approximately 570 million years ago.

PVC Polyvinyl chloride

QC Quality control

Quaternary A period of geologic time thought to have covered the last 2 or 3 million years. Also, the corresponding system of rocks.

RCRA Resource Conservation and Recovery Act

Recent An epoch of geologic time thought to have covered the last 10,000 years.

schist A rock formed by dynamic metamorphism that has a high degree of planar arrangement of textural or structural features, and so can readily be split into thin flakes or slabs.

SDWS Secondary drinking water standard(s)

specific capacity The rate of discharge of a water well per unit of drawdown, commonly expressed as gallons per minute per foot.

specific conductivity With reference to the movement of water in soil, a factor expressing the volume of transported water per unit of time in a given area.

STP Sewage treatment plant

stratigraphy The systematic arrangement or partitioning of the sequence of rock strata into units with reference to any or all of the many different characteristics, properties, or attributes the strata may possess. Also, the interpretation of these units in terms of their origin, occurrence, environment, thickness, lithology, composition, age, and relation to other geologic concepts.

TAC Tactical Air Command

TAC/NORAD Tactical Air Command/North American Air Defense Command

TCE Trichloroethylene

TDS Total dissolved solids

Tertiary The first period of the Cenozoic era, thought to have covered the span of time between 66 and 3 to 2 million years ago.

TFWC Tactical Fighter Weapons Center

TOC Total organic carbon

TOP Technical Operations Plan

TOX Total organic halogens

transmissivity The rate at which water is transmitted through a unit width under a unit hydraulic gradient.

upgradient In the direction of increasing hydraulic static head; the opposite of the direction in which ground water flows.

USAF United States Air Force

USEPA United States Environmental Protection Agency

USGS United States Geological Survey

water table That surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

APPENDIX B

STATEMENT OF WORK

ORDER FOR SUPPLIES OR SERVICES

2. PROC INSTRUMENT ID NO. (PIIN)	3. CALL/ORDER NO.	4. DATE OF ORDER*	5. REQUISITION/PURCHASE REQUEST PROJECT NO.	6. CERTIFIED FOR NATIONAL DEFENSE UNDER BDC REG 2/DMS REG 1 RATING
F33615-83-D-4002	0037	86JUL15	FY7624-86-01010	DO-S1

Mark all packages & papers with this number.

7. ISSUED BY CODE FO8419

DEPARTMENT OF THE AIR FORCE
AIR FORCE SYSTEMS COMMAND
AERONAUTICAL SYSTEMS DIV/PMRSC
WRIGHT-PATTERSON AFB OH 45433-6503
CONTRACT NEGOTIATOR:
GLENNITH C. JOHNSON
PHONE: (513)-255-3042

8. ADMINISTERED BY CODE S1403A

DCASMA CHICAGO
O'HARE INTERNATIONAL AIRPORT
P.O. BOX 66911
CHICAGO IL 60666-0911

9. CONTRACTOR NAME AND ADDRESS CODE 1S346 FACILITY CODE IF "9" FOR MULTIPLE FACILITIES SEE SECT "G"

DAMES & MOORE
1550 NORTHWEST HIGHWAY
PARK RIDGE IL 60068

PHONE: (312)-297-6120
COUNTY: COOK

MAILING DATE

SEP 23 1986

DUPLICATE ORIGINAL

10. MAIL INVOICES TO

11. DISCOUNT FOR PROMPT PAYMENT

1ST N % ___ DAYS NET DAYS
2ND ___ % ___ DAYS OTHER IF "9" SEE SECT "B"
3RD ___ % ___ DAYS

12A. PURCHASE OFFICE POINT OF CONTACT

LRX/L72/LRX

12B. RESERVED FOR SERVICE/AGENCY USE

13. PAYMENT WILL BE MADE BY CODE S1402A IF "9" SEE SECT "G"

DCASR CHICAGO
O'HARE INTERNATIONAL AIRPORT
P.O. BOX 66475
CHICAGO IL 60666-0475

14. TYPE CONTRACTOR	15. SECURITY A. CLAS	B. DATE OF DD 254
A	U	

16. CONTRACT ADMINISTRATION DATA A. FAST PAY	B. CONTRACT (1) KIND	(2) TYPE	C. ABSTRACT RECIP ADP POINT	D. SPL CONT PROVISIONS	E. CONT ADMIN FUNC LMT	17. (RESERVED)	18. SVC/AGENCY USE	19. SURV CRIT	20. TOTAL AMOUNT
	0	9						C	NOT-TO-EXCEED $ 150,138.00

21. APPROPRIATION AND ACCOUNTING DATA

A. ACTY CLAS	B. ACRN	C. APPROPRIATION	D. LIMIT SUBHEAD	E. SUPPLEMENTAL ACCOUNTING CLASSIFICATION
U	AA	5763400		306 4740 5H4499 000007 59200 000000 528500

F. CPN RECIPIENT DODAAD	G. OBLIGATION AMOUNT	H. NON-CLIN/ELIN PAYMENT PROV	I. SVC AGENCY USE
F28500	$150,138.00		FY7624-86-01010 AND AMD 01

22A TYPE OF ORDER: DELIVERY X — B. NON-DOD CONTRACT NO. This delivery order is subject to instructions contained on this side of form only and is issued in accordance with and subject to terms and conditions of above numbered contract, or Non-DOD Contract No.

PURCHASE — Reference your ___ Furnish the following on terms specified herein, including, for U.S. purchases, General Provisions of Purchase Order on DD Form 1155r (EXCEPT CLAUSE NO. 13 APPLIES ONLY IF THIS BOX IS CHECKED AND NO. 15 IF THIS BOX IS CHECKED), special provisions ___ and delivery as indicated. This purchase is negotiated under authority of 10 USC 2304(a)( ) or as specified in the schedule if within the U.S., its possessions or Puerto Rico; if otherwise, under 2304(a)(6).

If checked, Additional General Provisions apply, supplier shall sign Acceptance on DD Form 1155r and return ___ copies.

*If quantity accepted by the Government is same as quantity ordered, indicated by ✓ mark. If different enter actual quantity accepted below quantity ordered and encircle.

23. UNITED STATES OF AMERICA

Howard E. Marks Jr. 9/12/86

BY HOWARD E. MARKS JR. (YYMMMDD) NAME OF CONTRACTING/ORDERING OFFICER AND DATE

24. TOTAL
28. DIFFERENCES

25. QUANTITY ORDERED HAS BEEN ☐ INSPECTED ☐ RECEIVED ☐ ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS STATED

DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

26. SHIP NO. ☐ PARTIAL ☐ FINAL
27. D.O. VOUCHER NO.
29. INITIALS
30. PAYMENT ☐ COMPLETE ☐ PARTIAL ☐ FINAL
31. PAID BY
32. Amount Verified Correct For
33. CHECK NUMBER
34. BILL OF LADING NO.

35. I CERTIFY THIS AMOUNT IS CORRECT AND PROPER FOR PAYMENT

SIGNATURE AND TITLE OF CERTIFYING OFFICER

36. RECEIVED AT	37. RECEIVED BY	38. DATE RECEIVED	39. TOTAL CONTAINERS	40. S/R ACCOUNT NUMBER	41. S/R VOUCHER NO.

PREVIOUS EDITION IS OBSOLETE.

AFSC FORM AUG 80 700

*When used as a formal contract this will be the effective date.

AFSC—Andrews AFB Md 1980

PART I SECTION B OF THE SCHEDULE
SUPPLIES LINE ITEM DATA

1. PROC INSTRUMENT ID NO. (PIIN): F33615-83-D-4002
2. SPIIN: 0037
3. PAGE 2 OF 21

4. ITEM NO.: 0001 | 5. QUANTITY*: 1 | 6. PURCH UNIT: LO | 7. UNIT PRICE: $ N | 8. TOTAL ITEM AMOUNT*: $ N

9. SCTY CLAS: U | 10. ACRN: AA | 11. NSN: N | 12. FSCM AND PART NUMBER | 13. CIRR

14. SITE CODES A. POA: D B. ACP: D C. FOB: D | 15. NOUN: AIR SAMPLING, ANALYSIS, AND DATA | 16. SVC/AGENCY USE

17. PR/MIPR DATA: FY7624-86-01010-0001 | 18. AUTHORIZED RATE A. PROGRESS PAY % B. RECOUP % | 19. CONTRACT PERCENT FEE % | 20. SVC ID NO. | 21. ITEM/PROJ MGR: FY7624

22. 1ST DISCOUNT A. % B. DAYS | 23. 2ND DISCOUNT A. % B. DAYS | 24. 3RD DISCOUNT A. % B. DAYS | 25. NET DAYS | 26. QUANTITY VARIANCE A. OVER % B. UNDER % | 27. TYPE CONTRACT: Y | 28. OPR

29. DESCRIPTIVE DATA

CONDUCT WORK IAW THE TASK DESCRIPTION OF THIS ORDER AND SECTION C, THE DESCRIPTION/SPECIFICATIONS OF THE BASIC CONTRACT. SUBMIT DATA IAW ATTACHMENT# 1 , THE CONTRACT DATA REQUIREMENTS LIST OF THE BASIC CONTRACT, AS IMPLEMENTED BY PARAGRAPH VI OF THE TASK DESCRIPTION.

THIS DELIVERY ORDER CONFIRMS THE VERBAL AUTHORITY TO PROCEED GIVEN BY THE CONTRACTING OFFCER TO THE CONTRACTOR ON 86 JUL 10 PURSUANT TO THE "EMERGENCY SERVICES" CLAUSE OF THE BASIC CONTRACT. DO NOT DUPLICATE.

4. ITEM NO.: 0002 | 5. QUANTITY*: 1 | 6. PURCH UNIT: LO | 7. UNIT PRICE: $ N | 8. TOTAL ITEM AMOUNT*: $ N

9. SCTY CLAS: U | 10. ACRN: AA | 11. NSN: N | 12. FSCM AND PART NUMBER | 13. CIRR

14. SITE CODES A. POA: D B. ACP: D C. FOB: D | 15. NOUN: SUPPORT | 16. SVC/AGENCY USE

17. PR/MIPR DATA: FY7624-86-01010-0002 | 18. AUTHORIZED RATE A. PROGRESS PAY % B. RECOUP % | 19. CONTRACT PERCENT FEE % | 20. SVC ID NO. | 21. ITEM/PROJ MGR: FY7624

22. 1ST DISCOUNT A. % B. DAYS | 23. 2ND DISCOUNT A. % B. DAYS | 24. 3RD DISCOUNT A. % B. DAYS | 25. NET DAYS | 26. QUANTITY VARIANCE A. OVER % B. UNDER % | 27. TYPE CONTRACT: Y | 28. OPR

29. DESCRIPTIVE DATA

PROVIDE SUPPORT IN ACCORDANCE WITH THE TASK DESCRIPTION OF THIS ORDER AND SECTION C, THE DESCRIPTION/SPECIFICATIONS OF THE BASIC CONTRACT.

THIS DELIVERY ORDER CONFIRMS THE VERBAL AUTHORITY TO PROCEED GIVEN BY THE CONTRACTING OFFCER TO THE CONTRACTOR ON 86 JUL 10 PURSUANT TO THE "EMERGENCY SERVICES" CLAUSE OF THE BASIC CONTRACT. DO NOT DUPLICATE.

*REPRESENTS NET AMOUNT OF INCREASE/DECREASE WHEN MODIFYING EXISTING ITEM NO.

N = NOT APPLICABLE
U = UNDEFINITIZED
NSP = NOT SEPARATELY PRICED
E = ESTIMATED
− (IN QTY AND $) = DECREASE
+ OR − (IN ITEM NO.) = ADDITION OR DELETION
CIRR: CONTROLLED ITEM RPT RQMT
SITE CODES: S = SOURCE, D = DESTINATION, O = INTERMEDIATE

AFSC FORM JAN 80 705 — PREVIOUS EDITION WILL BE USED. — AFSC—Andrews AFB Md 1980

PART I SECTION B OF THE SCHEDULE
SUPPLIES LINE ITEM DATA

1. PROC INSTRUMENT ID NO. (PIIN): F33615-83-D-4002
2. SPIIN: 0027
3. PAGE 2 OF 21

4. ITEM NO.: 0004
5. QUANTITY*: 1
6. PURCH UNIT: LO
7. UNIT PRICE: $ N
8. TOTAL ITEM AMOUNT*: $ N
9. SCTY CLAS: U
10. ACRN: AA
11. NSN: N
12. FSCM AND PART NUMBER
13. CIRR
14. SITE CODES A. POA: D B. ACP: D C. FOB: D
15. NOUN: CHEM/PHYS ANALYSIS AND DATA
16. SVC/AGENCY USE
17. PR/MIPR DATA: FY7624-86-01010-0004
18. AUTHORIZED RATE A. PROGRESS PAY % B. RECOUP %
19. CONTRACT PERCENT FEE %
20. SVC ID NO.
21. ITEM/PROJ MGR: FY7624
22. 1ST DISCOUNT A. % B. DAYS
23. 2ND DISCOUNT A. % B. DAYS
24. 3RD DISCOUNT A. % B. DAYS
25. NET DAYS
26. QUANTITY VARIANCE A. OVER % B. UNDER %
27. TYPE CONTRACT: J
28. OPR
29. DESCRIPTIVE DATA

PERFORM CHEMICAL TESTS IAW THE TASK DESCRIPTION OF THIS ORDER AND SECTION C, THE DESCRIPTION/SPECIFICATIONS OF THE BASIC CONTRACT. SUBMIT DATA IAW ATTACHMENT# 1 , THE CONTRACT DATA REQUIREMENTS LIST OF THE BASIC CONTRACT, AS IMPLEMENTED BY PARAGRAPH VI OF THE TASK DESCRIPTION.

THIS DELIVERY ORDER CONFIRMS THE VERBAL AUTHORITY TO PROCEED GIVEN BY THE CONTRACTING OFFCER TO THE CONTRACTOR ON 86 JUL 10 PURSUANT TO THE "EMERGENCY SERVICES" CLAUSE OF THE BASIC CONTRACT. DO NOT DUPLICATE.

4. ITEM NO.
5. QUANTITY*
6. PURCH UNIT
7. UNIT PRICE $
8. TOTAL ITEM AMOUNT* $
9. SCTY CLAS
10. ACRN
11. NSN
12. FSCM AND PART NUMBER
13. CIRR
14. SITE CODES A. POA B. ACP C. FOB
15. NOUN
16. SVC/AGENCY USE
17. PR/MIPR DATA
18. AUTHORIZED RATE A. PROGRESS PAY % B. RECOUP %
19. CONTRACT PERCENT FEE %
20. SVC ID NO.
21. ITEM/PROJ MGR
22. 1ST DISCOUNT A. % B. DAYS
23. 2ND DISCOUNT A. % B. DAYS
24. 3RD DISCOUNT A. % B. DAYS
25. NET DAYS
26. QUANTITY VARIANCE A. OVER % B. UNDER %
27. TYPE CONTRACT
28. OPR
29. DESCRIPTIVE DATA

*REPRESENTS NET AMOUNT OF INCREASE/DECREASE WHEN MODIFYING EXISTING ITEM NO

N = NOT APPLICABLE
U = UNDEFINITIZED
NSP = NOT SEPARATELY PRICED

E = ESTIMATED
− (IN QTY AND $) = DECREASE
\+ OR − (IN ITEM NO) = ADDITION OR DELETION
CIRR: CONTROLLED ITEM RPT RQMT

SITE CODES: S = SOURCE, D = DESTINATION, O = INTERMEDIATE

AFSC FORM JAN 80 705 PREVIOUS EDITION WILL BE USED. AFSC—Andrews AFB Md 1980

86 JUN 04

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION (STAGE 2)
Eielson Air Force Base, Alaska

I. DESCRIPTION OF WORK

The overall objective of the Phase II investigation is to define the magnitude, extent, direction and rate of movement of identified contaminants. A series of staged field investigations may be required to meet this objective.

During the initial survey (Stage 1) performed at Eielson AFB, four individual sites (Sites 3, 32, 2 and 1) were investigated, along with the Fuel Saturated Area. A limited number of monitoring wells and soil borings were emplaced, and soil and water samples were analyzed for general screening parameters (i.e., TOC, TOX, etc.).

This Stage 2 effort will build on the information previously gathered for Sites 3, 32, 2 and 1. The Fuel Saturated Area is being investigated as a Phase IV action and is not addressed in this effort. Additional wells and borings will be installed during this Stage 2 effort, and specific chemical analyses (i.e., Volatile Organics by gas chromatography, etc.) performed to identify any contamination present at Sites 3, 32, 2, or 1.

The purpose of this task is to undertake a field investigation at Eielson Air Force Base, Alaska: (1) to confirm the presence of suspected contamination within the specified areas of investigation; (2) to determine the magnitude of contamination and the potential for migration of those contaminants in the various environmental media; (3) identify public health and environmental hazards of migrating pollutants based on State or Federal standards for those contaminants; and (4) delineate additional investigations required beyond this stage to reach the Phase II objectives.

The Phase I and Phase II, Stage 1 IRP Reports (mailed under separate cover) incorporate the background, description and previous studies of all the sites for this task. To accomplish this survey effort, the contractor shall take the following actions:

A. Technical Operations Plan

Develop a Technical Operations Plan (TOP) based on the technical requirements specified in this task description for the proposed work effort. (See Sequence No. 19, Item VI below). This plan shall be explicit with regard to field procedures. The format for the TOP is provided under separate cover. The TOP shall be mailed to the USAFOEHL POC within two (2) weeks after Notice to Proceed for this delivery order.

B. Health and Safety

Comply with USAF, OSHA, EPA, state and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for

designating the appropriate levels of protection at study sites. Prepare a written Health and Safety Plan for the proposed work effort and coordinate it directly with applicable regulatory agencies prior to commencing field operations (i.e., drilling and sampling) as specified in Sequence No. 7, Item VI below). Provide an information copy of the Health and Safety Plan to the USAFOEHL after coordination with the regulatory agencies.

C. General Field Work

1. Installation of Groundwater Monitoring Wells

a. Monitor ambient air during all well drilling and soil boring work with a photoionization meter or equivalent organic vapor detector to identify the generation of potentially hazardous and/or toxic vapors or gases. Include air monitoring results in the boring logs.

b. Determine the exact location of all monitor wells and soil borings during the planning/mobilization phase of the field investigation. Consult with the Eielson AFB POC to minimize disruption of base activities, to properly position wells with respect to exact site locations, and to avoid underground utilities. Direct the drilling and sampling and maintain a detailed log of the conditions and materials penetrated during the course of the work.

c. Comply with the U.S. EPA Publication 330/9-S1-002, NEIC Manual for Ground Water/Subsurface Investigations at Hazard Waste Sites for monitoring well installation.

d. All well drilling, development, purging, and sampling methods must conform to State and other applicable regulatory agency requirements. Cite references in an appendix of the Report.

e. Install wells at a sufficient depth to collect samples representative of aquifer quality and to intercept contaminants if they are present.

f. Drill all monitoring wells using the following specifications:

(1) Drill all wells using techniques most appropriate for the geological formation underlying each site. If drilling fluid additives such as bentonite or polymers are used, ensure their components will not interfere with the chemical analyses to be performed on samples. Biodegradable organic drilling fluid additives are not permitted. Also, if an additive is used, split a sample of the additive. Analyze one part of the sample and send the other part to USAFOEHL/SA for analysis. Prior to well completion, flush all boreholes constructed with drilling mud by using drinking water.

(2) Take samples for stratigraphic control purposes at 5-foot intervals, where possible, and log them. Include pilot boring logs and well completion summaries in the Final Report (Sequence No. 4, Item VI, below).

(3) Drill a maximum of 8 wells. Total footage of all wells in this task shall not exceed 270 linear feet. Refer to the site specific details in Section ID.

(4) Construct each well with 2-inch inside diameter Schedule 40 PVC casing. Use threaded screw-type joints, glued fittings are not permitted. Screen each well using 2-inch diameter casing having up to 0.010 inch slots; use the same material as that of the casing. Cap the bottom of the screen. Flush thread all connections.

(5) Screen all wells so as to collect floating contaminants and to allow for yearly fluctuations of the water table. Screen all wells a minimum of 10 feet. A minimum of 8 feet of well screen should be below the groundwater table if feasible. High seasonal fluctuations in groundwater levels should be considered when designing the intervals of well screening needed.

g. Complete all monitoring wells using the following specifications:

(1) Once the casing is installed, allow the soil formation to collapse around the well screen, if appropriate. Where required, use a gravel pack of washed and bagged rounded silica sand or gravel with a grain size distribution compatible with the screen and soil formation. Place the pack from the bottom of the borehole to two feet above the top of the screen. Tremie a bentonite seal (two foot minimum) above the sand/gravel pack. Ensure the bentonite forms a complete seal. Grout the remainder of the annulus to the land surface with bentonite cement grout.

(2) Well surface completion will depend upon location. The Eielson AFB POC will determine which method is used at each well:

(a) If well stick-up is of concern in an area, complete the well flush with the land surface. Cut the casing two to three inches below land surface, and cement a protective locking lid in place. The protective lid shall consist of a cast-iron valve box assembly centered in a three foot diameter concrete pad sloped away from the valve box. Ensure that free drainage is maintained within the valve box. Also, provide a screw-type casing cap to prevent infiltration of surface water. Maintain a minimum of one foot clearance between the casing top and the bottom of the valve box. Clearly mark the well number on the valve box lid.

(b) If an above ground surface completion is used, extend the well casing two or three feet above land surface. Prove an end-plug or casing cap for each well. Shield the extended casing with a steel guard pipe which is placed over the casing and cap, and seated in a two-foot by two-foot by four-inch concrete surface pad. Slope the pad away from the well sleeve. Install a lockable cap or lid at the casing. Install three 3-inch diameter steel guard posts if Eielson AFB POC determines the well is in an area which needs such protection. The guard posts shall be five feet in

total length and installed radially from each wellhead. Recess the guard posts approximately two feet into the ground. Paint the protective steel sleeve and clearly number the well on the sleeve exterior.

Provide locks for all wells. Turn the lock keys over to the Eielson AFB POC following completion of the field work.

(3) Develop each well with a submersible pump, bailer, and/or airlift method. Continue well development until the discharge water is clear and free of sediment to the fullest extent possible.

(4) Determine by survey the elevation of all newly installed monitoring wells to an accuracy of 0.01 feet. Horizontally locate the new wells to an accuracy of 1.0 feet and record the position on both project and site specific maps. Use bench marks traceable to a USCGS or USGS survey marker if available.

(5) Measure water levels at all monitoring wells as feet below the ground surface or below the top of casing elevation to the nearest 0.01 feet. Report in terms of mean sea level. Measure static water levels in wells at the time of well development and prior to sampling.

2. Soil Borings

a. Install a maximum of 4 soil borings not to exceed a total of 40 linear feet. Accomplish the borings using hollow-stem auger techniques, if possible.

b. During the boring operations, develop lithographic descriptions and stratigraphic logs. Place special emphasis on field identification of contaminated soils encountered.

c. Scan all soil cores with a photoionization meter or equivalent organic vapor detector. Include monitoring results in the boring logs.

3. Borehole and Well Abandonment

a. Determine available techniques for well abandonment that are applicable to the type of monitoring wells installed and geological conditions at each well site. After consultation with the USAFOEHL and Eielson POCs, abandon any Stage 1 well that is damaged or inoperable. A maximum of five wells will be abandoned as part of this effort. Recommend the technique(s) appropriate to the future abandonment of all other monitoring wells (abandonment not part of this contract).

b. Tremie grout all boreholes and abandoned well to the surface with a bentonite grout. It is especially important to insure that they be adequately resealed to preclude future migration of contaminants.

c. Permanently mark each location where soil borings are drilled or wells were abandoned. Record the location on a project map for each specific site.

4. Well and Borehole Cleanup. Remove any well/borehole cuttings if requested by the Eielson POC and clean the general area following the completion of each well/borehole.

5. Sampling and Analysis

a. Strictly comply with the sampling techniques, maximum holding times, and preservation of samples as specified in the following references: Standard Methods for the Examination of Water and Wastewater, 16th Edition (1985), pages 37-44; ASTM, Section 11, Water and Environmental Technology; Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition (USEPA, 1984); and Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pages xiii to xix (1983). All chemical analyses (water and soil) shall meet the required limits of detection for the applicable EPA method identified in Appendix 1.

b. Allow wells to stabilize after development for a minimum of one day before sampling.

c. Sample wells during maximum groundwater flow conditions (late summer/early fall). Consider weather and hydrogeological parameters in the decision making process. As the first step of groundwater sampling operations at each well, take water level measurements to the nearest 0.01 foot with respect to an established surveyed point on top of the well casing. After measurements are taken, purge the well using a submersible pump. Purge until a minimum of three complete well volumes of water have been displaced and the pH, temperature, specific conductance, color, and odor of the discharge have stabilized, using the following criteria: pH ± 0.1 unit, temperature ± 0.5°C, specific conductance ± 10 µmhos. Include the final measurements in the results section of the draft and final reports

d. Collect well water samples with a Teflon bailer. During sample collection from all wells, examine the surface of the water table for the presence of hydrocarbons and, if applicable, measure the thickness of the hydrocarbon layer. If floating hydrocarbons are noted, use a "thief sampler" or similar device to collect the water sample.

e. If the well(s) cannot be sampled due to well development, well characteristics, or other reason(s), indicate the reason(s) in the report specified in Item VI below.

f. Split all water and soil samples. Analyze one set and immediately deliver the other set (the same collection day) to the base POC. The base POC will select 10% of the split samples, package the selections with appropriate forms, and deliver them to the contractor within 24 hours of receipt. Supply all packing and shipping materials to the base POC for packaging the split samples. Immediately ship (within 24 hours) the POC selected samples through overnight delivery to:

USAFOEHL/SA
Bldg 140
Brooks AFB TX 78235-5501

Include the following information with the samples sent to the USAFOEHL:

(1) Purpose of sample (analyte and sample group)

(2) Installation name (base)

(3) Sample number

(4) Source/location of sample

(5) Contract Task Numbers and Title of Project

(6) Method of collection (bailer, suction pump, air-lift pump, etc.)

(7) Volumes removed before sample taken

(8) Special Conditions (use of surrogate standard, special nonstandard preservations, etc.)

(9) Preservatives used

(10) Date and time collected

(11) Collector's name or initials

Forward this information with each sample by properly completing an AF Form 2752A "Environmental Sampling Data" and/or AF Form 2752B "Environmental Sampling Data - Trace Organics", working copies of which have been provided under separate cover. Label each sample container to reflect the data in (1), (2), (3), (4), (9), (10), and (11). In addition, copies of field logs documenting sample collection should accompany the samples.

Maintain chain-of-custody records for all samples, field blanks, and quality control samples.

g. Analyze an additional 10% of all samples, for each parameter, for field quality control purposes (field duplicates), as indicated in Appendix 1. Include all quality control procedures and data in draft and final reports. Duplicates shall be indistinguishable from other analytical samples so that the analytical personnel cannot determine which samples are duplicates.

h. For those methods which employ gas chromatography (GC) as the analytical technique (i.e., E602, SW8080, etc.) positive confirmation of identity is required for all analytes having concentrations higher than the

Method Detection Limit (MDL); confirm positive concentrations by second-column GC. Analytes which cannot be confirmed will be reported as "Not Detected" in the body of the report. Include the results of all second-column GC confirmational analyses in the report appendix along with other raw analytical data. Base the quantification of confirmed analytes upon the first-column analysis.

The maximum number of second-column confirmational analyses shall not exceed fifty percent (50%) of actual number of field samples (to include field QA/QC samples). The total number of samples for each GC method listed in Appendix 1 includes this allowance.

i. Analyze water and soil samples collected as specified in Section D for those parameters summarized in Appendix 3. The required detection limits and methods for these analyses are delineated in Appendix 1.

j. All chemical/physical analyses shall conform to state and other applicable federal and local regulatory agency legal requirements. If a regulatory agency requires that an analysis or analyses be performed in a certified laboratory, assure compliance with the requirement by furnishing documentation showing laboratory certification with the first analyses results to USAFOEHL/TS.

6. Decontamination Procedures

a. Decontaminate all sampling equipment prior to use and between samples to avoid cross contamination. Wash equipment with a laboratory-grade detergent followed by clean water, solvent (methanol) and distilled water rinses. Allow sufficient time for the solvent to evaporate and the equipment to dry completely.

b. Dedicate a monofilament line or steel wire used to lower bailers for each well; do not use a line in more than one well. The calibrated water level indicator for measuring well volume and fluid elevation must be decontaminated before use in each well.

c. Thoroughly clean and decontaminate the drilling rig and tools before initial use and after each borehole completion. As a minimum, steam clean drill bits after each borehole is installed. Drill from the "least" to the "most" contaminated areas, if possible.

7. Plot and map all field data collected for each site according to surveyed positions. Identify or estimate the nature of contamination and the magnitude and potential for contaminant flow within each site to receiving steams and groundwater.

8. Conduct a premobilization survey of all base sites. The purpose of the survey is to meet with base personnel, finalize the actual field techniques used in the effort, evaluate condition of Stage 1 wells and designate borehole and monitoring well locations. USAFOEHL representatives will accompany the contractor during the premobilization survey, if possible. Alaskan Air Command and regulatory agency representatives may also

accompany the contractor during the premobilization survey. The USAFOEHL Program Manager will notify the contractor not later than one week following the Notice to Proceed (NTP) of the exact number of personnel to accompany the contractor on the premobilization survey.

9. Any precious metals encountered on USAF installations during site investigations remain the property of the U.S. Air Force. Disclose the area of discovery to only the USAFOEHL program manager and the base commander. Discontinue work at the area of discovery until receiving guidance from the USAFOEHL. Work scheduled in other areas shall continue.

D. Specific Site Work

In addition to items delineated above, conduct the following specific actions at the sites listed below:

1. Site 3 - Current Landfill

a. Conduct an earth resistivity (ER) survey downgradient of the site to determine the areal extent of any contaminant plume.

b. Based upon the results of the ER survey, emplace one upgradient and two downgradient wells at the site. Each well is anticipated to be approximately 30 feet deep.

c. Obtain one groundwater sample from each well at the site, well W-2 (existing) and the three new wells. Analyze each sample (4 total) for volatile organics (E601 and 602), arsenic, cadmium, chromium, lead, mercury, silver, TDS and petroleum hydrocarbons.

2. Site 32 - Sewage Treatment Plant Spill Ponds

a. Conduct an ER survey downgradient of the site to determine the areal extent of any contaminant plume.

b. Based upon the results of the ER survey, emplace one upgradient and two downgradient wells at the site. Each well is anticipated to be approximately 30 feet deep.

c. Perform a slug test on the upgradient well to determine the hydraulic conductivity of the surficial aquifer.

d. Obtain one groundwater sample from each well at the site, well W-7 (existing) and the three new wells. Analyze each sample (4 total) for volatile organics (E601 and 602), lead, nitrates, TDS and petroleum hydrocarbons.

3. Site 2 - Old (1960-1967) Base Landfill

a. Emplace one monitoring well upgradient of the site and one well downgradient. The downgradient well shall be further downgradient than existing wells W-8 and W-9. Each well shall be approximately 30 feet deep.

b. Obtain one groundwater sample from each well at the site, wells W-8, W-9 and the two new wells.

c. Analyze each sample (4 total) for volatile organics (E601 and 602), lead, arsenic, cadmium, chromium, mercury, silver, TDS and petroleum hydrocarbons.

4. Site 1 - Old (1950-1960) Base Landfill

a. Resample well W-10. Analyze the sample for volatile organics (E601 and 602), pesticides (E608), lead, TDS and petroleum hydrocarbons.

b. Perform a soil boring program at the sites by installing four borings at compass points from 5 to 15 feet around well W-10. Each boring shall be approximately 7½ feet deep. Obtain soil samples at the surface and at 2½, 5 and 7½ feet from each boring. Analyze the samples (16 total) for pesticides (E608).

E. General Base Guidance

1. Be cognizant of and observe the AF base rules and regulations while working in the area.

2. A minimum of 7 days advance notice prior to arrival on base must be given to the Eielson AFB POC. Clearance must be granted prior to arrival at the base.

F. Data Review

1. Tabulate field and analytical laboratory results, including field and laboratory parameters and QA/QC data, and incorporate them into the next monthly R&D Status Reports to be forwarded to the USAFOEHL. In addition to the results, report the following: the time and dates for sample collection, extraction (if applicable) and analysis; the methods used and method detection limits achieved; a cross-reference for laboratory sample numbers and field sample numbers; a cross-reference of field sample numbers to sites; and include the chain-of-custody form for those sample data.

2. Upon completion of all analyses, tabulate and incorporate all results into an Informal Technical Information Report (Sequence No. 3, Item VI below) and forward the report to USAFOEHL for review prior to submission of the draft report.

3. Immediately report to the USAFOEHL Program Manager via telephone, data/results generated during this investigation which indicate a potential health risk (for example, a contaminated drinking water aquifer). Follow the telephone notification with a written notice and lab raw data (e.g., chromatograms, etc.) within three days.

G. Reporting

1. Prepare a draft report delineating all findings of this field investigation and forward it to the USAFOEHL (as specified in Sequence No. 4, Item VI below) for Air Force review and comment. Draft reports are considered "drafts" only in the sense that they have not been reviewed and approved by Air Force officials. In all other respects, "drafts" must be complete, in the proper format, and free of grammatical and typographical errors. Include a discussion of the regional/site specific hydrogeology, well and boring logs, data from water level surveys, aquifer tests, ER surveys, groundwater surface and gradient maps, water quality and soil analysis results, available geohydrologic cross sections, and laboratory and field QA/QC information. Follow the USAFOEHL supplied format (mailed under separate cover). The format is an integral part of this delivery order.

2. Results, conclusions and recommendations concerning the sites listed in this task which were produced in the technical report(s) of the previous staged work of IRP Phase II (mailed under separate cover), shall be used in the data reduction to plot any trends and arrive at the conclusions and recommendations of this effort's technical report (Sequence 4, Item VI below). The technical report of this effort shall be accomplished so that the report will reflect the combined up-to-date trend of each of the IRP Phase II sites listed herein.

3. In the results section, include water and soil analysis results, field quality control sample data, internal laboratory quality controlled data (lab blanks, lab spikes, and lab duplicates), and laboratory quality assurance information. Provide second column confirmation results and include which columns were used, the conditions existing, and retention times. Summarize the specific collection techniques, analytical method, holding time, and limit of detection for each analyte (Standard Methods, EPA, etc.) in the Appendix.

4. Make estimates of the magnitude, extent and direction which detected contaminants are moving. Identify potential environmental consequences of discovered contamination, where known, based upon State or Federal standards.

5. In the recommendation section, address each site and list them by category:

a. Category I consists of sites where no further action (including remedial action) is required. Data for these sites are considered sufficient to rule out unacceptable public health or environmental hazards.

b. Category II sites are those requiring additional Phase II effort to determine the direction, magnitude, rate of movement and extent of detected contaminants. Identify potential environmental consequences of discovered contamination, where known.

c. Category III sites are those that will require remedial actions (ready for IRP Phase IV). In the recommendations for Category III sites, include any possible influence on sites in Categories I and/or II due

to their connection with the same hydrological system. Clearly state any dependency between sites in different categories. Include a list of candidate remedial action alternatives, including Long Term Monitoring (LTM) as remedial action, and the corresponding rationale that should be considered in selecting the remedial action for a given site. List all alternatives that could potentially bring the site into compliance with environmental standards. For contaminants that do not have standards, EPA recommended safe levels for noncarcinogens (Health Advisory or Suggested-No-Adverse-Response Levels) and target levels for carcinogens (1 x 10^{-6} cancer risk level) may be used. Unless specifically requested, do not perform any cost analyses, including a cost/benefit review for remedial action alternatives. However, in those situations where field survey data indicate immediate corrective action is necessary, present specific, detailed recommendations.

For each category above, summarize the results of field data, environmental or regulatory criteria, or other pertinent information supporting conclusions and recommendations.

6. Provide cost estimates by line item for future efforts recommended for Category II sites and LTM Category III sites. Submit these estimates concurrently with the approved final technical report in a separately bound document. For Category II sites, develop detailed site-specific estimates using prioritized costing format (i.e., cost of conducting the required work on: the highest priority site only; the first two highest priority sites only; the first three highest priority sites only; etc., until all required work is discretely costed) for the proposed work effort. The Air Force determines the priority of sites by using contractor recommendations as a decision basis. Consider the type of contaminants, their magnitude, the direction and rate of their migration, and their subsequent potential for environmental and health consequences when prioritizing sites. For Category III sites slated for long-term monitoring, develop site-specific estimates which detail the costs associated with (1) permanent installation of monitoring wells; (2) groundwater sampling interface equipment, including permanent installations of pumps and sampling lines; and (3) four quarterly (1 year period) sample collections and laboratory chemical analyses of groundwater, etc. Only the cost requirement outlined in Sequence No. 2, Item VI, need be submitted.

H. Meetings

The contractor's project leader shall attend 2 meeting(s) to take place at a time to be specified by the USAFOEHL. Each meeting shall last for a duration of two eight hour days. Meeting locations are anticipated as follows:

1- Anchorage,
1- Eielson AFB.

II. SITE LOCATIONS AND DATES:

Eielson Air Force Base

Dates to be established.

III. BASE SUPPORT:

A. Prior to any contractor digging or drilling, locate underground utilities and issue digging permits.

B. Provide the contractor with existing engineering plans, drawings, diagrams, aerial photographs, etc., as needed to evaluate sites under investigation.

C. Provide escort into restricted areas.

D. Arrange for and have available prior to the start-up of field work, the following services, materials, work space, and items of equipment to support the contractor conducting the survey:

1. Personnel identification badges and vehicle passes and/or entry permits.

2. An area (preferably paved) where drilling equipment can be cleaned and decontaminated. A source of potable water (i.e., ordinary outdoor water faucet) and 110/115 VAC electrical outlet must be available within 25 feet of the area for steam cleaner hookup.

3. A temporary office area not to exceed 100 square feet equipped with a Class A telephone for local and long distance phone calls. Contractor shall pay for any long distance telephone calls made by his personnel from this phone.

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT:

1. USAFOEHL Program Manager
Ms Dee A. Sanders
USAFOEHL/TSS
Brooks AFB TX 78235-5501
(512) 536-2158
AUTOVON 240-2158/2159
1-800-821-4528

2. MAJCOM Monitor
Lt Col David A. Nuss
AAC/SGPB
Elmendorf AFB AK 99506-5000
(907) 552-4282
AUTOVON 317-552-4282

3. Eielson AFB Monitor

VI. In addition to sequence numbers 1, 5 and 11 listed in Attachment 1 to the contract, and which apply to all orders, the sequence numbers listed below are applicable to this order. Also shown are dates applicable to this order.

Sequence No.	Para No.	Block 10	Block 11	Block 12	Block 13	Block 14
19 (TOP)*	I.A	OTIME	86JUL15	86JUL29		15
7 (Health & Safety)	I.B	OTIME	86JUL15	86JUL29		3
3 (Prelim Data)	I.F.2	OTIME	***	***		3
4 (Tech. Rpt)	I.F.1	ONE/R	86NOV14	86NOV20	87FEB04	**
2 (Cost Est)	I.G.6	O/TIME	86NOV20	87FEB04		*****
14		Monthly	86JUL15	86AUG15	****	3
15		Monthly	86JUL15	86AUG15	****	3

*The Technical Operations Plans (TOP) required for this stage is due within 2 weeks of the Notice to Proceed (NTP).

**Two draft reports (25 copies of each) and one final report (50 copies plus the original camera ready copy) are required. Incorporate Air Force comments into the second draft and final reports as specified by the USAFOEHL. Supply the USAFOEHL with a copy of the first draft, second draft, and final reports for acceptance prior to distribution. Distribute remaining 24 copies of each draft report and 49 copies of the final report as specified by the USAFOEHL.

***Upon completion of the total analytical effort before submission of the first draft report.

****Submit monthly hereafter.

*****Submit with final report only.

Appendix 1

Analytical Methods, Detection Limits, and Number of Samples

Parameter[a]	Method[b] Extraction/ Analysis)	Detection Limit	No. of Samples	QC	Total Samples
Petroleum hydrocarbons	E418.1	100 µg/L	13	2	15
Volatile Organics	E601 & E602	c	13	2	23[e]
Pesticides	E608	c	1 (water)	1	3[e]
	SW3550/SW8080	c	16 (soil)	2	27[e]
Total Dissolved Solids (TDS)	E160.1	10 mg/L[d]	13	2	15
Nitrates	E353.1	0.01 mg/L(as N)	4	1	5
Lead	E239.2	0.005 mg/L[d]	13	2	15
Arsenic	E206.2	0.001 mg/L	8	1	9
Cadmium	E200.7	0.004 mg/L	8	1	9
Chromium	E200.7	0.007 mg/L	8	1	9
Mercury	E245.1	0.0002 mg/L	8	1	9
Silver	E200.7	0.007 mg/L	8	1	9

[a]Specific analytes for Volatile Organics and Pesticides are listed in Appendix 2.

[b]The methods cited in the analysis protocols come from the following sources:

"E" Methods (Water Only)

<u>E100 through E500 Methods</u>
Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020 (USEPA, 1983)

<u>E600 Series Methods</u>
Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
USEPA
Federal Register, Vol 49, No 209, 26 Oct 1984

"SW" Methods (Water & Soils)

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition (USEPA, 1984)

[c]Detection limits for all parameters analyzed by GC shall be as stated in the respective methods. Report results for organics in water as µg/l; in soil as mg/kg. Positive identification is required for all analytes having concentration higher than the method detection limit; confirm positive concentrations by second-column GC. Analytes which cannot be confirmed shall be reported as "Not Dectected" in the body of the report. Include the results of both first and second-column data in the appendix of the report. Base the quantification of confirmed analytes upon the first-column analysis.

[d]Report results as mg/L. Report no more than two significant figures for any concentrations.

[e]Total number of samples includes second-column confirmation on 50% of field samples (to include field QC samples).

Appendix 2

Volatile Organics - EPA Methods 601 and 602

Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chlorobenzene
Chloroethane
2-Chloroethylvinyl ether
Chloroform
Chloromethane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethyl benzene
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene (TCE)
Trichlorofluoromethane
Vinyl chloride

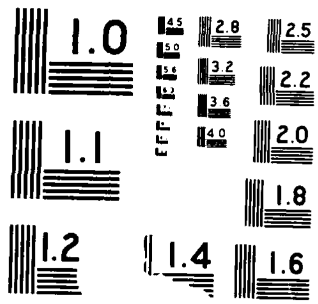
Pesticides - Methods E608 and SW8080

Aldrin
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Toxaphene
PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260

AD-A193 106 INSTALLATION RESTORATION PROGRAM PHASE 2 CONFIRMATION/QUANTIFICATION STAGE 2(U) DAMES AND MOORE PARK RIDGE IL 03 APR 88 F33615-83-D-4002

2/4

UNCLASSIFIED F/G 24/4 NL


1.0
1.1
1.2
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6

Appendix 3

Analyses by Site - Eielson AFS

Analyte	Water Site 3	Water Site 32	Water Site 2	Water Site 1		Soil Site 1
Petroleum Hydrocarbons	4	4	4	1		
Volatile Organics	4	4	4	1		
Pesticides (E608)	--	--	--	1		
Pesticides (SW8080)						16
TDS	4	4	4	1		
Nitrates	--	4	--	--		
Lead	4	4	4	1		
Arsenic	4	--	4	--		
Cadmium	4	--	4	--		
Chromium	4	--	4	--		
Mercury	4	--	4	--		
Silver	4	--	4	--		

PART I SECTION F OF THE SCHEDULE SUPPLIES SCHEDULE DATA	1. PROC INSTRUMENT ID NO. (PIIN) F33615-83-D-4002	2. SPIIN 0037	3. PAGE 21 OF 21

4. ITEM NO.	5. ACRN	6. TSP PRI	7. MILSTRIP DOC NO. AND SUFFIX	8. CON ITEM SERIAL NO.	9. ENDING SERIAL NO. (WHEN APPL)	10. CLIN IDENT EXHIBIT
0001	AA					

11. DEL SCHED DATE	12. ENDING DATE (WHEN APPL)	13. DEL SCHEDULE QTY*	14. SCTY CLAS	15. SHIP TO	16. MARK FOR
A. 87MAY15	A.	A. 1	U	FY7624	
B.	B.	B.	D.	D.	D.
C.	C.	C.	E.	E.	E.

17. DESCRIPTIVE DATA

A. SEE SECTION H OF THE BASIC CONTRACT FOR FY7624 ADDRESS.

B. TECHNICAL EFFORT SHALL BE COMPLETED NO LATER THAN 86NOV14.
C. ALL DATA SHALL BE DELIVERED IAW ATTACHMENT# 1 OF THE BASIC CONTRACT AS IMPLEMENTED BY PARAGRAPH VI OF THE TASK DESCRIPTION NO LATER THAN 87FEB04.
D. THE DATA SHALL BE ACCEPTED BY THE GOVERNMENT NOT LATER THAN THE DATE SHOWN IN BLOCK 11A

4. ITEM NO.	5. ACRN	6. TSP PRI	7. MILSTRIP DOC NO. AND SUFFIX	8. CON ITEM SERIAL NO.	9. ENDING SERIAL NO. (WHEN APPL)	10. CLIN IDENT EXHIBIT
0002	AA					

11. DEL SCHED DATE	12. ENDING DATE (WHEN APPL)	13. DEL SCHEDULE QTY*	14. SCTY CLAS	15. SHIP TO	16. MARK FOR
A. 87MAY15	A.	A. 1	U	FY7624	
B.	B.	B.	D.	D.	D.
C.	C.	C.	E.	E.	E.

17. DESCRIPTIVE DATA

A. SEE SECTION H OF THE BASIC CONTRACT FOR FY7624 ADDRESS.

B. TECHNICAL EFFORT SHALL BE COMPLETED NO LATER THAN 86NOV14.

4. ITEM NO.	5. ACRN	6. TSP PRI	7. MILSTRIP DOC NO. AND SUFFIX	8. CON ITEM SERIAL NO.	9. ENDING SERIAL NO. (WHEN APPL)	10. CLIN IDENT EXHIBIT
0004	AA					

11. DEL SCHED DATE	12. ENDING DATE (WHEN APPL)	13. DEL SCHEDULE QTY*	14. SCTY CLAS	15. SHIP TO	16. MARK FOR
A. 87MAY15	A.	A. 1	U	FY7624	
B.	B.	B.	D.	D.	D.
C.	C.	C.	E.	E.	E.

17. DESCRIPTIVE DATA

A. SEE SECTION H OF THE BASIC CONTRACT FOR FY7624 ADDRESS.

B. TECHNICAL EFFORT SHALL BE COMPLETED NO LATER THAN 86NOV14.
C. ALL CHEMICAL ANALYSIS DATA SHALL BE DELIVERED IAW ATTACHMENT# 2 AS IMPLEMENTED BY PARAGRAPH VI OF THE TASK DESCRIPTION NO LATER THAN 87FEB04.
D. THE DATA SHALL BE ACCEPTED BY THE GOVERNMENT NOT LATER THAN THE DATE SHOWN IN BLOCK 11A

*REPRESENTS A NET INCREASE/DECREASE WHEN NO + OR − APPEARS AFTER THE ITEM NO.
E = ESTIMATED
− (IN QTY) = DECREASE
+ OR − (IN ITEM NO.) = ADDITION OR DELETION

APPENDIX C

WELL NUMBERING SYSTEM

GROUND WATER WELL AND SOIL BORING NUMBERING SYSTEM

GROUND WATER MONITOR WELL

The ground water monitor well numbering system consists of three fields. Field 1 is the abbreviation "GW," which indicates ground water. This distinguishes these monitor wells from the Phase II, Stage 1 monitor wells, which were labeled "W."

Field 2 indicates the site number of the well location (i.e., 32 or 2). Field 3 indicates the sequential order in which the monitor wells are drilled, lettered consecutively beginning with the letter "A."

SOIL BORING

The soil borings are numbered according to a system similar to that used for the ground water monitor wells. Field 1 is the abbreviation "B," which indicates boring. Field 2 indicates the site number of the boring location (i.e., 1). Field 3 indicates the sequential order in which the borings are drilled, lettered consecutively beginning with the letter "A."

APPENDIX D

BORING AND WELL COMPLETION LOGS

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL GRADED GRAVELS, GRAVEL SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY GRADED GRAVELS, GRAVEL SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL SAND SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL SAND CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE				SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND SILT MIXTURES
				SC	CLAYEY SANDS, SAND CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

SOIL CLASSIFICATION CHART

MATERIAL SIZE	PARTICLE SIZE			
	LOWER LIMIT		UPPER LIMIT	
	MILLIMETERS	SIEVE SIZE*	MILLIMETERS	SIEVE SIZE*
SAND				
FINE	.074	#200*	0.42	#40*
MEDIUM	0.42	#40*	2.00	#10*
COARSE	2.00	#10*	4.76	#4*
GRAVEL				
FINE	4.76	#4*	19.1	3/4"*
COARSE	19.1	3/4"*	76.2	3"*
COBBLES	76.2	3"*	304.8	12"*
BOULDERS	304.8	12"*	914.4	36"

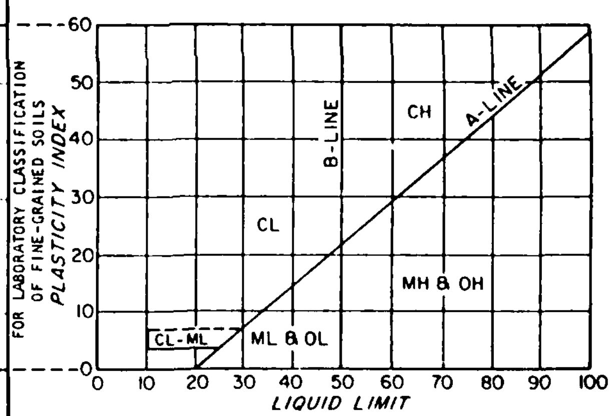
*U. S. STANDARD *CLEAR SQUARE OPENINGS

GRADATION CHART

EXPLANATION:

THE NUMBER OF BLOWS REQUIRED TO DRIVE THE 2.0" O.D. BY 1.4" I.D. STANDARD SPLIT SPOON SAMPLER 12" OR LENGTH INDICATED WITH A 140 POUND HAMMER FALLING 30".

15 DEPTH OF DISTURBED SAMPLE OBTAINED WITH THE SPLIT SPOON SAMPLER.



PLASTICITY CHART

NOTES: 1. DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE CLASSIFICATIONS OR INTERMIXED STRATA.

2. WHEN USED ON THE BORING LOGS, THE FOLLOWING TERMS ARE USED TO DESCRIBE THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE COMPACTNESS OF COHESIONLESS SOILS:

COHESIVE SOILS	(APPROXIMATE SHEARING STRENGTH IN KSF)	COHESIONLESS SOILS	
VERY SOFT	LESS THAN 0.25	VERY LOOSE	THESE ARE USUALLY
SOFT	0.25 TO 0.5	LOOSE	BASED ON AN EXAMINATION
MEDIUM STIFF	0.5 TO 1.0	MEDIUM DENSE	OF SOIL SAMPLES,
STIFF	1.0 TO 2.0	DENSE	PENETRATION RESISTANCE,
VERY STIFF	2.0 TO 4.0	VERY DENSE	AND SOIL DENSITY DATA
HARD	GREATER THAN 4.0		

3. WHEN USED ON THE BORING LOGS, THE FOLLOWING TERMS INDICATE THE PERCENTAGES OF THE MINOR SOIL COMPONENTS: SOME: 10 TO 20% TRACE: 0 TO 10%

4. ELEVATIONS REFER TO MEAN SEA LEVEL (MSL).

UNIFIED SOIL CLASSIFICATION SYSTEM AND KEY TO LOG OF BORINGS

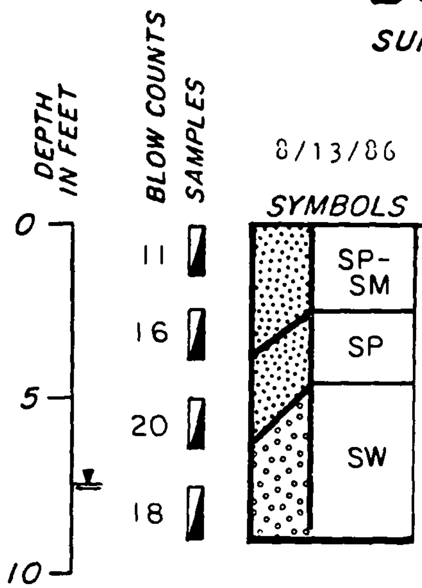
Dames & Moore

PLATE D-1

BORING B1-A

SURFACE ELEVATION: 544.3

8/13/86



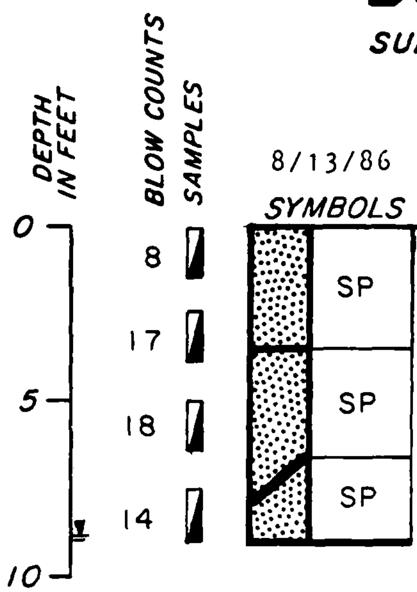
BLOW COUNTS	SYMBOLS	DESCRIPTIONS	HNU READING
11	SP-SM	BROWN SAND, SOME SILT, WITH TRACE OF GRAVEL	1.0
16	SP	BROWN SAND WITH SOME GRAVEL, NO FINES (POORLY-GRADED)	0
20	SW	BROWN SAND WITH SOME GRAVEL (WELL-GRADED)	0
18			0

BORING COMPLETED AT A DEPTH OF 9.0 FEET ON 8/13/86.
WATER ENCOUNTERED AT A DEPTH OF 7.5 FEET WHILE DRILLING.

PLATE D-2

BORING B1-C

SURFACE ELEVATION: 544.4



DESCRIPTIONS — HNU READING

BROWN SAND WITH TRACE SILT

GRAY SAND

GRADES TO BROWN SAND WITH SOME GRAVEL — 0

BROWN SAND WITH SOME GRAVEL AND TRACE OF SILT

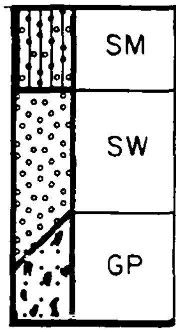
BORING COMPLETED AT A DEPTH OF 9.0 FEET ON 8/13/86.
WATER ENCOUNTERED AT A DEPTH OF 8.8 FEET WHILE DRILLING.

BORING B1-B

SURFACE ELEVATION: 544.4

8/13/86

DEPTH IN FEET	BLOW COUNTS	SAMPLES	SYMBOLS	DESCRIPTIONS	HNU READING
0	17		SM	BROWN SAND WITH SOME SILT AND TRACE OF GRAVEL	
	15		SW	BROWN SAND WITH SOME GRAVEL	0
5	36				
	22		GP	BROWN GRAVEL WITH TRACE OF SAND AND SILT	
10					

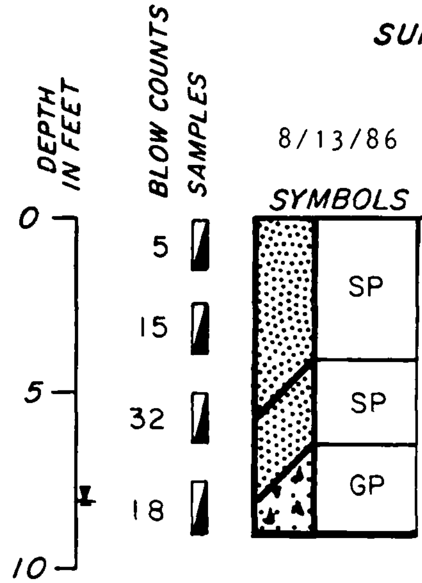


BORING COMPLETED AT A DEPTH OF 9.0 FEET ON 8/13/86.
WATER ENCOUNTERED AT A DEPTH OF 7.0 FEET WHILE DRILLING.

BORING B1-D

SURFACE ELEVATION: 544.4

8/13/86

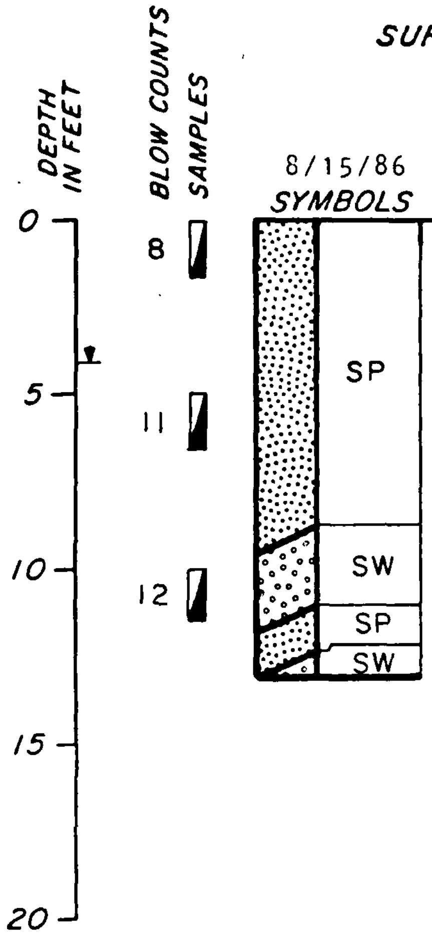


SYMBOLS	DESCRIPTIONS	HNU READING
SP	BROWN SAND WITH TRACE OF GRAVEL	
SP	GRADES TO BROWN AND LIGHT BROWN SAND WITH TRACE OF GRAVEL	
	LIGHT BROWN SAND WITH SOME GRAVEL	
GP	BROWN GRAVEL WITH SOME SAND	

BORING COMPLETED AT A DEPTH OF 9.0 FEET ON 8/13/86.
WATER ENCOUNTERED AT A DEPTH OF 8.0 FEET WHILE DRILLING.

BORING GW32-A

SURFACE ELEVATION: 524.9



DESCRIPTIONS | HNU READING

4" TOPSOIL
GRAY FINE SAND WITH TRACE OF FINES

SAND GRADES COARSER, SOME GRAVEL

GRAY COARSE SAND WITH SOME MEDIUM GRAVEL

GRAY MEDIUM SAND

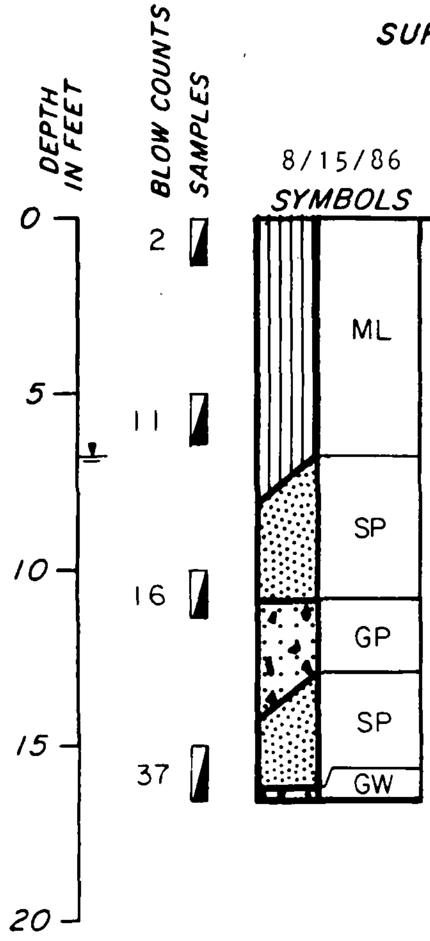
GRAY SAND GRADING TO GRAVEL

BORING COMPLETED AT A DEPTH OF 13.0 FEET ON 8-15/86.
WATER ENCOUNTERED AT A DEPTH OF 4.0 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

PLATE D-6

BORING GW32-B

SURFACE ELEVATION: 524.5



DESCRIPTIONS | HNU READING

TOPSOIL

PERCHED WATER AT 3.0 FEET

GRAY SILT WITH TRACE OF VERY FINE SAND, MICACEOUS

GRAY MEDIUM SAND

GRAY GRAVEL

GRAY MEDIUM SAND

GRAVEL, MEDIUM TO COARSE GRAINED

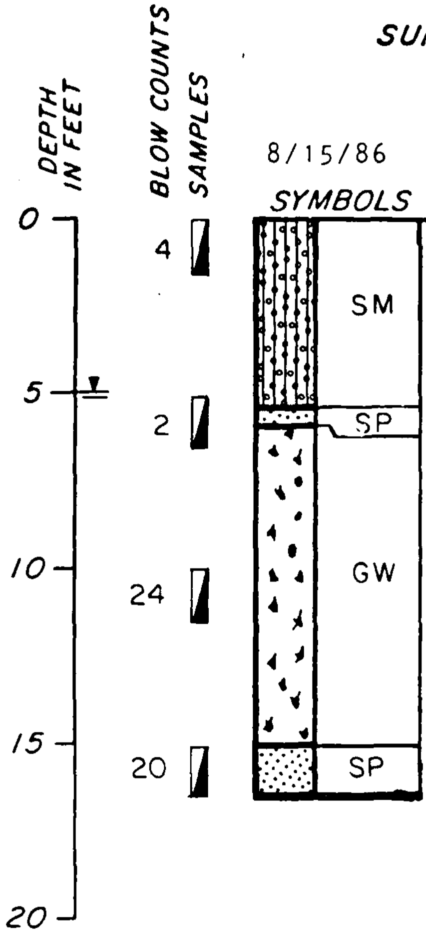
BORING COMPLETED AT A DEPTH OF 16.5 FEET ON 8/15/86.
WATER ENCOUNTERED AT A DEPTH OF 7.0 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

PLATE D-7

BORING GW32-C

SURFACE ELEVATION: 525.0

8/15/86



DESCRIPTIONS	HNU READING
BROWN SAND WITH SOME SILT, MICACEOUS	
BROWN MEDIUM SAND	
GRAVEL, MEDIUM TO COARSE GRAINED	
BROWN MEDIUM SAND, GRADING TO GRAVEL	

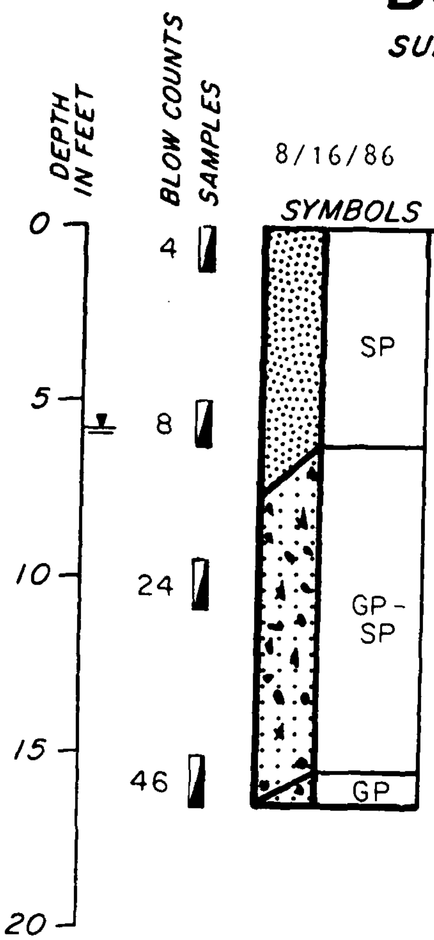
BORING COMPLETED AT A DEPTH OF 16.5 FEET ON 8/15/86.
WATER ENCOUNTERED AT A DEPTH OF 5.0 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

PLATE D-8

BORING GW32-D

SURFACE ELEVATION: 527.3

8/16/86



DESCRIPTIONS	HNU READING
2" TOPSOIL BROWN FINE SAND WITH TRACE OF SILT	
BROWNISH-GRAY SAND, GRADES TO NO SILT	
GRAY MEDIUM SAND WITH MEDIUM GRAVEL	
BROWN GRAVEL WITH SOME MEDIUM SAND (STRONG SEWAGE ODOR)	

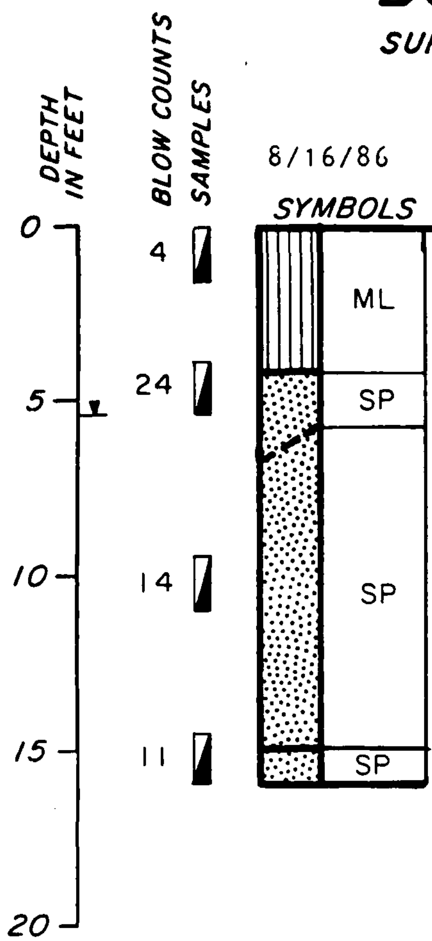
BORING COMPLETED AT A DEPTH OF 16.5 FEET ON 8/16/86.
WATER ENCOUNTERED AT A DEPTH OF 6.0 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

PLATE D-9

BORING GW32-E

SURFACE ELEVATION: 526.2

8/16/86



DESCRIPTIONS | HNU READING

4" TOPSOIL
BROWN SILT WITH SOME VERY FINE SAND, MICACEOUS

GRAY MEDIUM SAND WITH MEDIUM TO COARSE GRAVEL

BROWN MEDIUM SAND WITH MEDIUM GRAVEL (STRONG SEWAGE ODOR)

GRAY MEDIUM TO COARSE SAND WITH MEDIUM TO COARSE GRAVEL (STRONG SEWAGE ODOR)

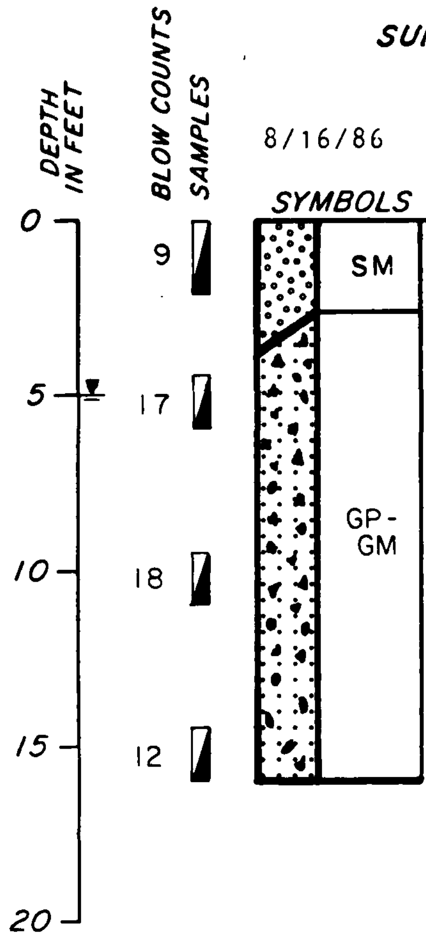
BORING COMPLETED AT A DEPTH OF 16.0 FEET ON 8/16/86.
WATER ENCOUNTERED AT A DEPTH OF 5.5 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

PLATE D-10

BORING GW32-F

SURFACE ELEVATION: 527.4

8/16/86



DESCRIPTIONS — HNU READING

3" TOPSOIL
BROWN VERY FINE SAND WITH SOME SILT, MICACEOUS
GRADES TO LESS SILT

MEDIUM TO COARSE GRAINED GRAVEL WITH TRACE OF SILT AND SAND (COBBLES AT 6.0 FEET TO BOTTOM OF BORING)

GRADES TO MORE SILT

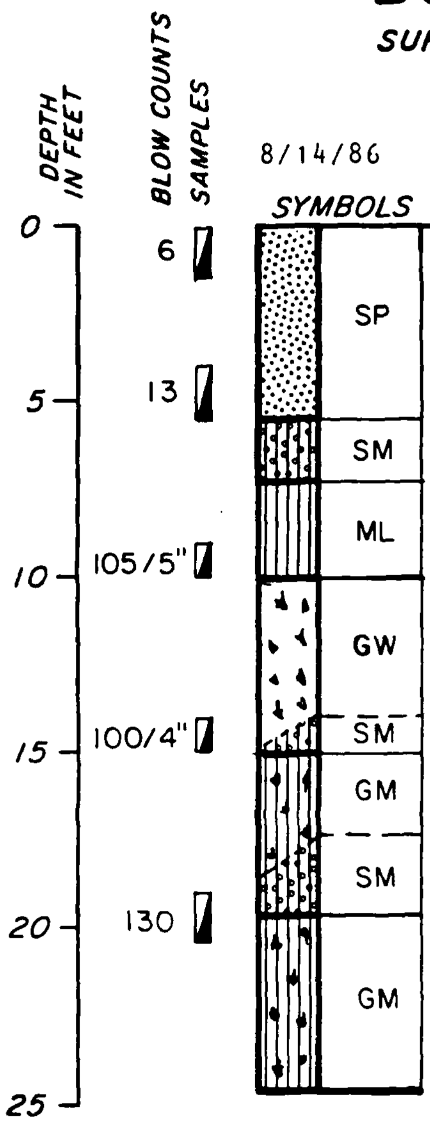
BORING COMPLETED AT A DEPTH OF 16.0 FEET ON 8/16/86.
WATER ENCOUNTERED AT A DEPTH OF 5.0 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

PLATE D-11

BORING GW2-A

SURFACE ELEVATION: 527.0

8/14/86



DESCRIPTIONS — HNU READING

LIGHT BROWN, VERY FINE SAND, SOME SILT
FROZEN AT 2.3 TO 3.0 FEET

GRADES TO MEDIUM GRAINED
ORANGE-BROWN AND GRAY MOTTLED SILT, MICACEOUS
FROZEN AT 7.0 TO 7.75 FEET
BROWN SILT AND SOME VERY FINE SAND

BROWN COARSE GRAVEL, WELL GRADED, FROZEN

GRADES TO
BROWN SILT AND VERY FINE SAND, MICACEOUS
GRAY GRAVEL AND SOME MEDIUM TO COARSE SAND
BROWN SILT AND SOME VERY FINE SAND

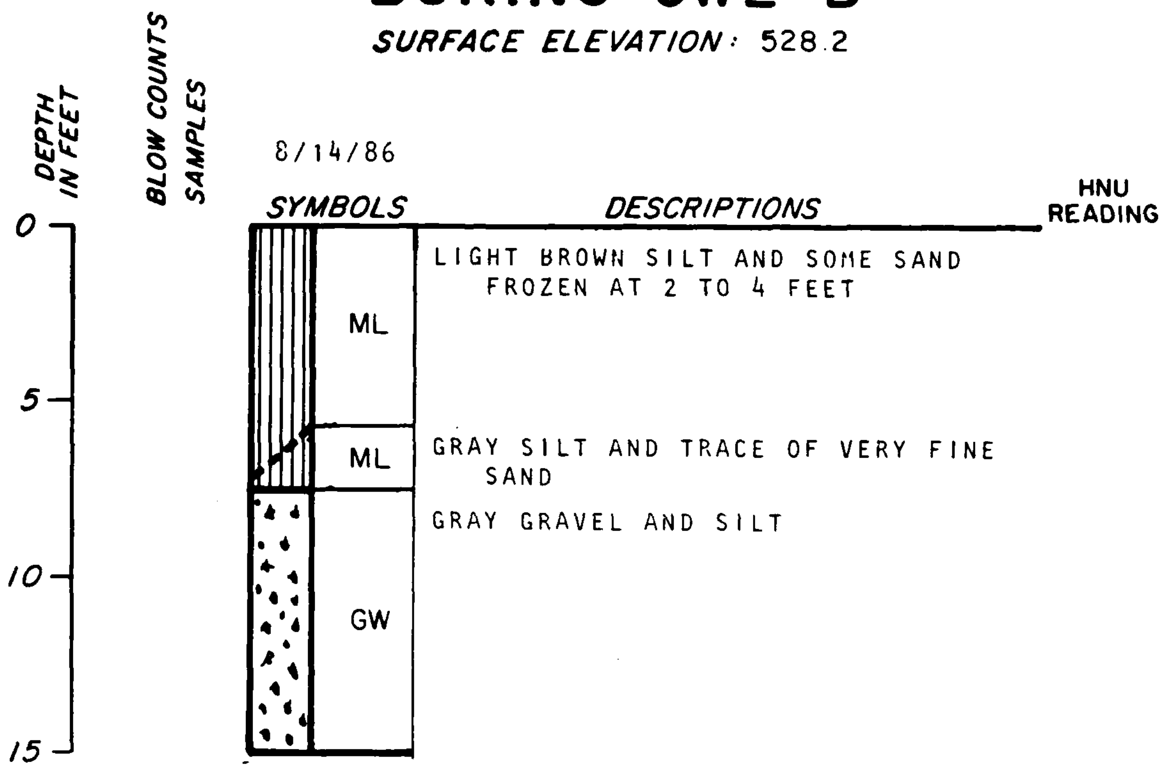
GRAY GRAVEL WITH COARSE SAND

BORING COMPLETED AT A DEPTH OF 24.5 FEET ON 8/14/86.
PERMAFROST ENCOUNTERED AT APPROXIMATELY 10.0 FEET.
HNu WAS NOT OPERATIONAL.

NO MONITORING WELL INSTALLED, PILOT BORING FOR GW2-B.

BORING GW2-B

SURFACE ELEVATION: 528.2



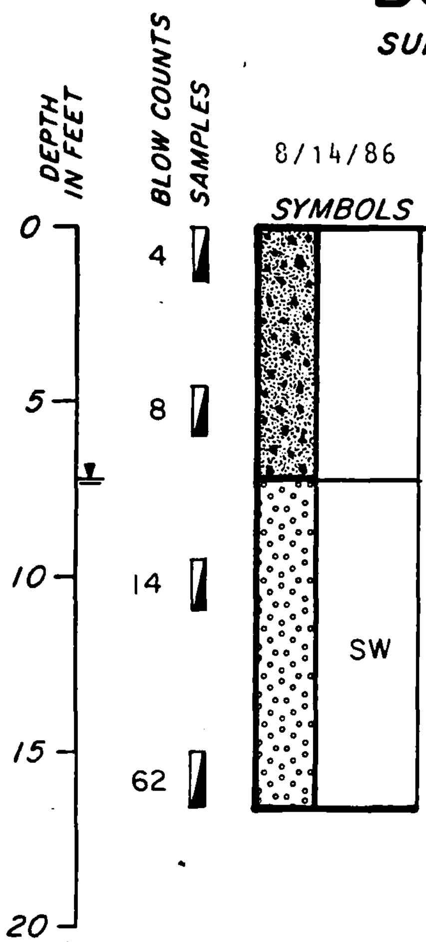
BORING COMPLETED AT A DEPTH OF 15.0 FEET ON 8/14/86.
WATER ENCOUNTERED AT A DEPTH OF 7.0 FEET WHILE DRILLING.
HNU WAS NOT OPERATIONAL.
SAMPLE DESCRIPTIONS BASED ON AUGER CUTTINGS.

PLATE D-13

BORING GW2-C

SURFACE ELEVATION: 529.0

8/14/86



DESCRIPTIONS	HNU READING
1" TOPSOIL	
TOPSOIL AND PEBBLES, FILL	
GRAY SAND WITH SOME GRAVEL	
SAND GRADES COARSER	

BORING COMPLETED AT A DEPTH OF 16.5 FEET ON 8/14/86.
WATER ENCOUNTERED AT A DEPTH OF 7.0 FEET WHILE DRILLING.
HNu WAS NOT OPERATIONAL.

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 524.9 (B.well)

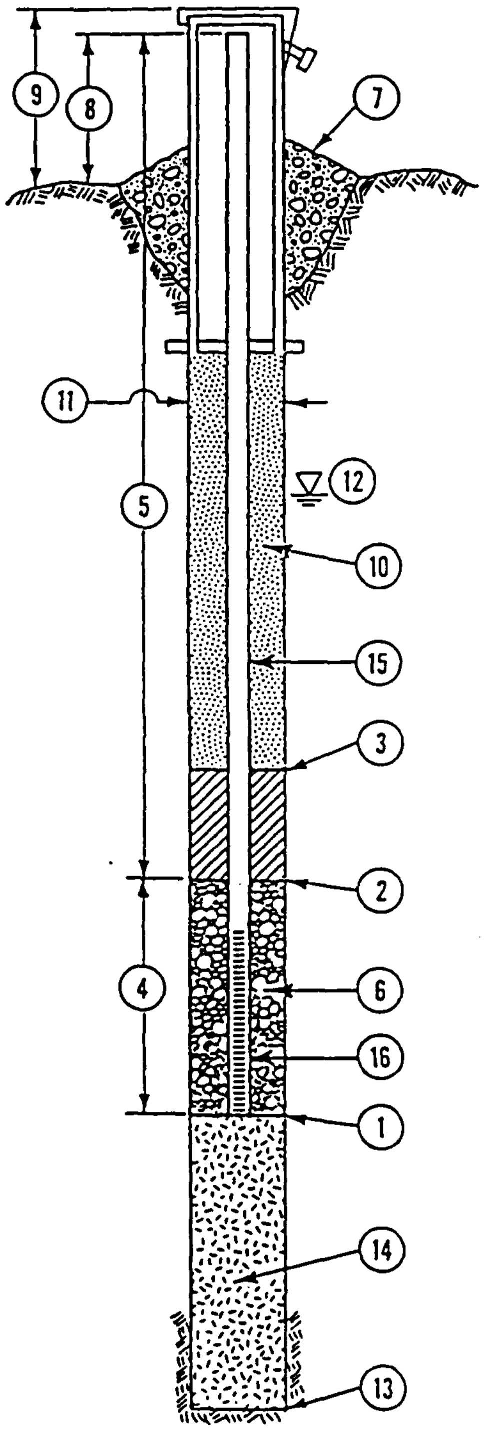
TOP OF WELL CASING ELEVATION 526.27 (PVC)

JOB NUMBER 1016-261

BORING NUMBER GW32-A

DATE 8/15/86

LOCATION Eielson AFB



1. DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 13.0 FEET.*
2. DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 3.0 FEET.*
3. DEPTH TO TOP OF SEAL (IF INSTALLED) 1.0 FEET.*
4. LENGTH OF WELL SCREEN 10 FEET. SLOT SIZE 0.010.
5. TOTAL LENGTH OF PIPE 14.37 FEET AT 2 INCH DIAMETER.
6. TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE Sand.
7. CONCRETE CAP. YES NO (CIRCLE ONE)
8. HEIGHT OF WELL CASING ABOVE GROUND 1.37 FEET.
9. PROTECTIVE CASING? YES NO (CIRCLE ONE) HEIGHT ABOVE GROUND ______ FEET. LOCKING CAP? YES NO (CIRCLE ONE)
10. TYPE OF UPPER BACKFILL cement-bentonite grout
11. BOREHOLE DIAMETER 8 INCHES.
12. DEPTH TO GROUND WATER 4.0 FEET.*
13. TOTAL DEPTH OF BOREHOLE 13.0 FEET.*
14. TYPE OF LOWER BACKFILL ——.
15. PIPE MATERIAL PVC.
16. SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 524.5 (B well)

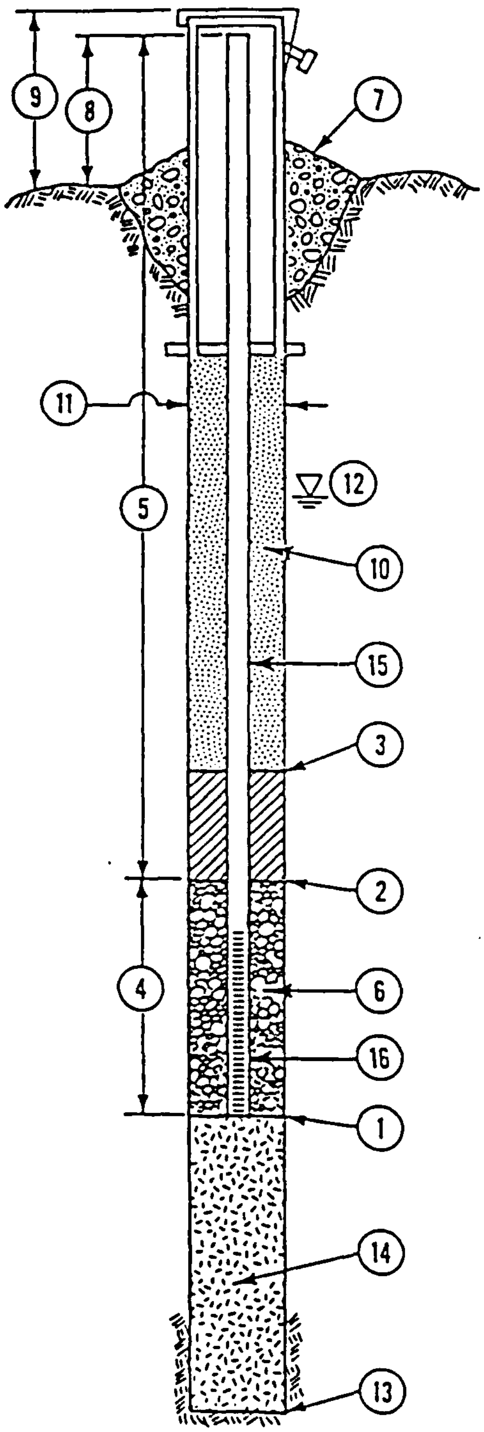
TOP OF WELL CASING ELEVATION 525.39 (PVC)

JOB NUMBER 1016-261

BORING NUMBER GW32-B

DATE 8/15/86

LOCATION Eielson AFB



1. DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.0 FEET.*
2. DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5.0 FEET.*
3. DEPTH TO TOP OF SEAL (IF INSTALLED) 3.0 FEET.*
4. LENGTH OF WELL SCREEN 10 FEET. SLOT SIZE 0.010.
5. TOTAL LENGTH OF PIPE 15.89 FEET AT 2 INCH DIAMETER.
6. TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE Sand.
7. CONCRETE CAP. YES NO (CIRCLE ONE)
8. HEIGHT OF WELL CASING ABOVE GROUND 0.89 FEET.
9. PROTECTIVE CASING? YES NO (CIRCLE ONE) HEIGHT ABOVE GROUND ____ FEET. LOCKING CAP? YES NO (CIRCLE ONE)
10. TYPE OF UPPER BACKFILL Cement-bentonite grout
11. BOREHOLE DIAMETER 8 INCHES.
12. DEPTH TO GROUND WATER 7.0 FEET.*
13. TOTAL DEPTH OF BOREHOLE 15.0 FEET.*
14. TYPE OF LOWER BACKFILL —.
15. PIPE MATERIAL PVC.
16. SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 525.0 (b. well)

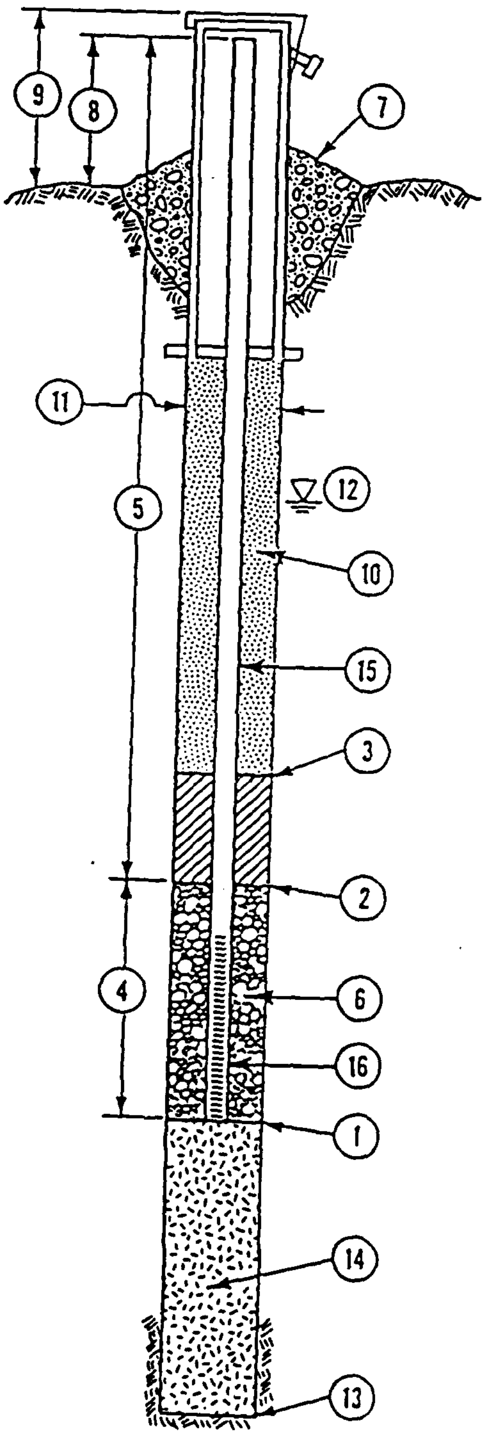
TOP OF WELL CASING ELEVATION 525.91 (pvc)

JOB NUMBER 1016-261

BORING NUMBER GW32-C

DATE 8/15/86

LOCATION Eielson AFB



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.0 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5.0 FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 3.0 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 15.91 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE Sand.

(7) CONCRETE CAP. YES NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 0.91 FEET.

(9) PROTECTIVE CASING? YES NO (CIRCLE ONE)
HEIGHT ABOVE GROUND ___ FEET.
LOCKING CAP? YES NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL cement-bentonite grout

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 5.0 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 15.0 FEET.*

(14) TYPE OF LOWER BACKFILL —.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 527.3 (b.well)

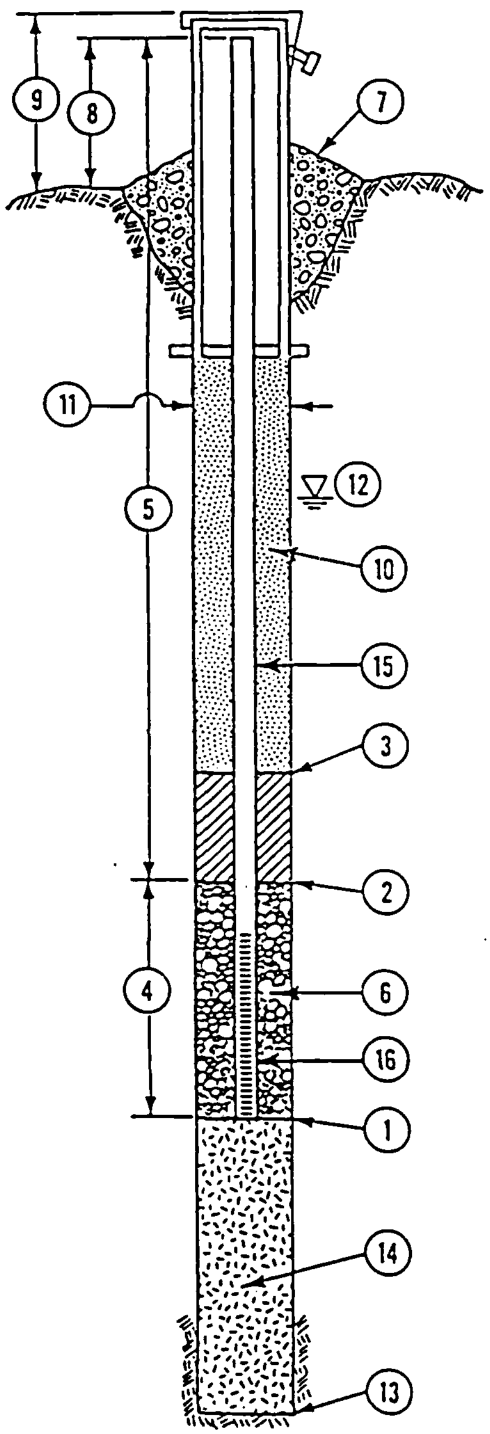
TOP OF WELL CASING ELEVATION 528.65 (PVC)

JOB NUMBER 1016-261

BORING NUMBER GW32-D

DATE 8/16/86

LOCATION Eielson AFB



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.0 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5.0 FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 3.0 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010 .

(5) TOTAL LENGTH OF PIPE 15.75 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE Sand .

(7) CONCRETE CAP. YES NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 0.75 FEET.

(9) PROTECTIVE CASING? YES NO (CIRCLE ONE)
HEIGHT ABOVE GROUND ______ FEET.
LOCKING CAP? YES NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL Cement-bentonite grout

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 6.0 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 15.0 FEET.*

(14) TYPE OF LOWER BACKFILL ______ .

(15) PIPE MATERIAL PVC .

(16) SCREEN MATERIAL PVC .

*(DEPTH FROM GROUND SURFACE)

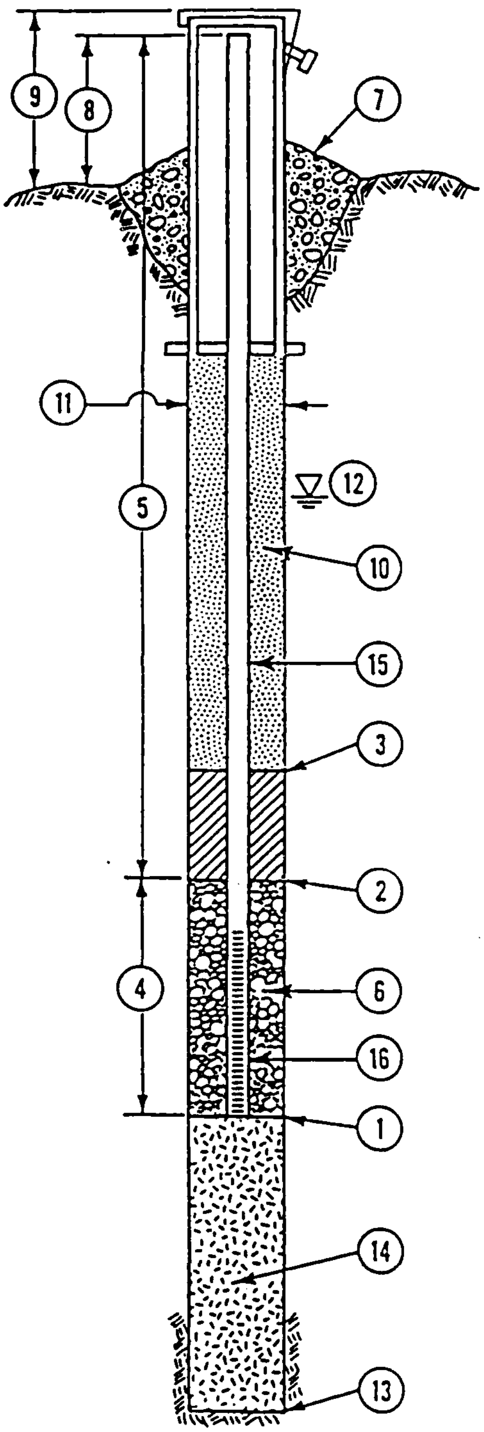
MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 526.2 (b. well)
TOP OF WELL CASING ELEVATION 527.02 (PVC)

JOB NUMBER 1016-261
BORING NUMBER GW32-E
DATE 8/16/86
LOCATION . Eielson AFB



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.0 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5.0 FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 3.0 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 15.82 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE sand.

(7) CONCRETE CAP. YES NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 0.82 FEET.

(9) PROTECTIVE CASING? YES NO (CIRCLE ONE)
HEIGHT ABOVE GROUND ______ FEET.
LOCKING CAP? YES NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL cement-bentonite grout

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 5.5 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 15.0 FEET.*

(14) TYPE OF LOWER BACKFILL ——.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 527.4 (b. well)

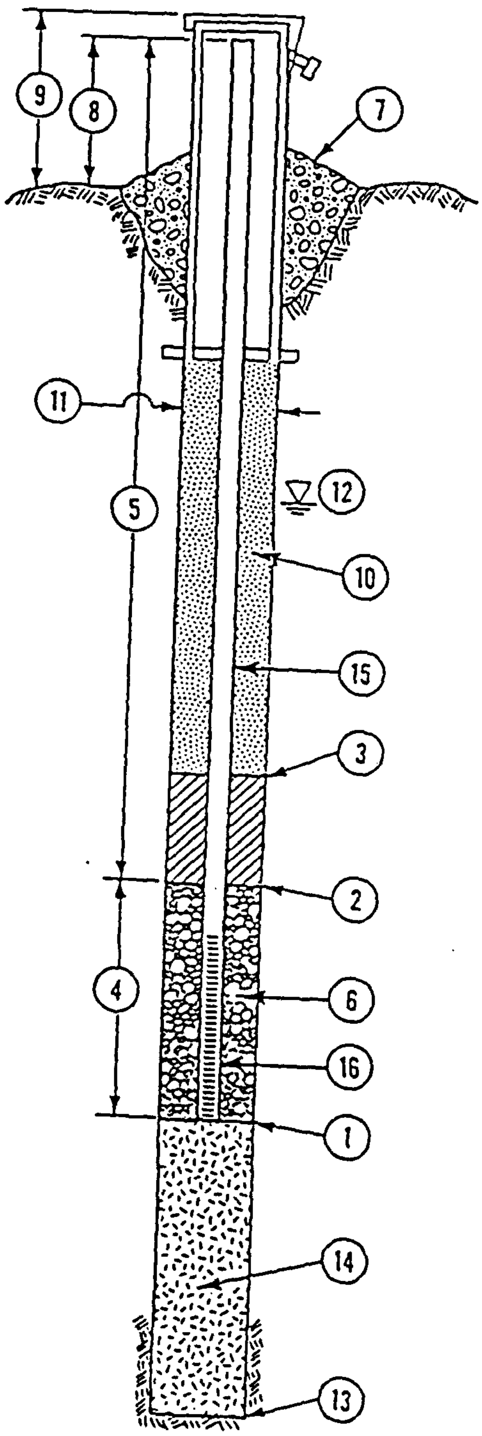
TOP OF WELL CASING ELEVATION 528.73 (PVC)

JOB NUMBER 1016-261

BORING NUMBER GW32-F

DATE 8/16/86

LOCATION Eielson AFB



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 14.5 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 4.5 FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2.5 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET.
SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 15.83 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE sand.

(7) CONCRETE CAP. YES NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 1.33 FEET.

(9) PROTECTIVE CASING? YES NO (CIRCLE ONE)
HEIGHT ABOVE GROUND ____ FEET.
LOCKING CAP? YES NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL Cement-bentonite grout

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 5.0 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 14.5 FEET.*

(14) TYPE OF LOWER BACKFILL —.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 528.2 (B.WM)

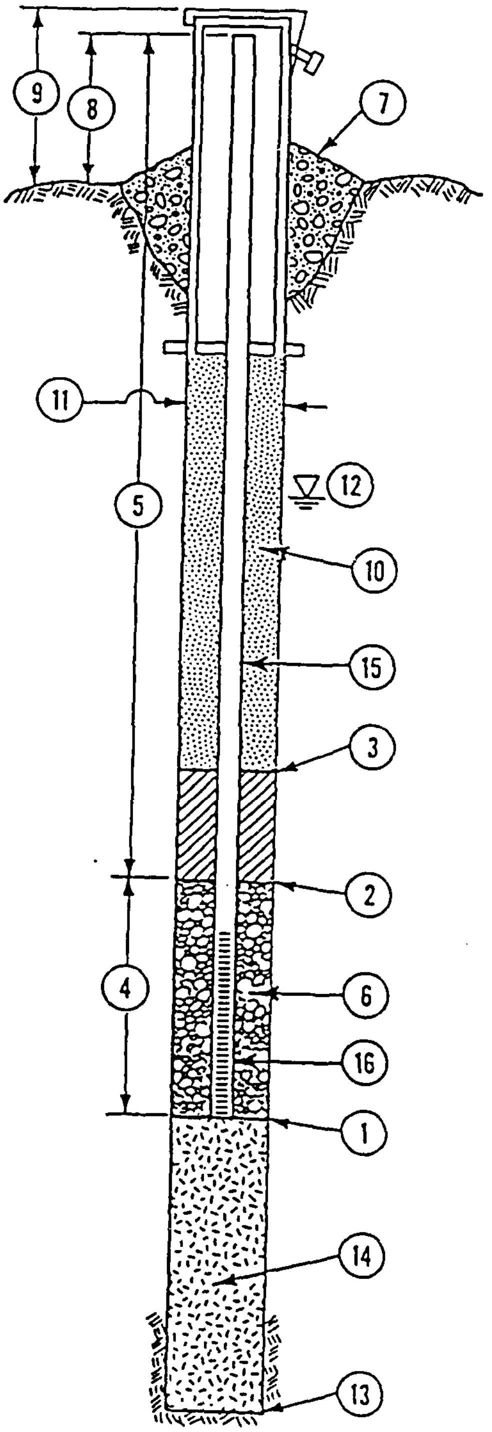
TOP OF WELL CASING ELEVATION 529.29 (PVC)

JOB NUMBER 1016-261

BORING NUMBER GW2-B

DATE 8/14/86

LOCATION Gielson AFB



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 14.5 FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 4.5 FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) 2.5 FEET.*

(4) LENGTH OF WELL SCREEN 10 FEET. SLOT SIZE 0.010.

(5) TOTAL LENGTH OF PIPE 15.59 FEET AT 2 INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE sand.

(7) CONCRETE CAP. YES NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND 1.09 FEET.

(9) PROTECTIVE CASING? YES NO (CIRCLE ONE)
HEIGHT ABOVE GROUND ______ FEET.
LOCKING CAP? YES NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL cement-bentonite grout

(11) BOREHOLE DIAMETER 8 INCHES.

(12) DEPTH TO GROUND WATER 7.0 FEET.*

(13) TOTAL DEPTH OF BOREHOLE 14.5 FEET.*

(14) TYPE OF LOWER BACKFILL —.

(15) PIPE MATERIAL PVC.

(16) SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION 529.0 (B. well)

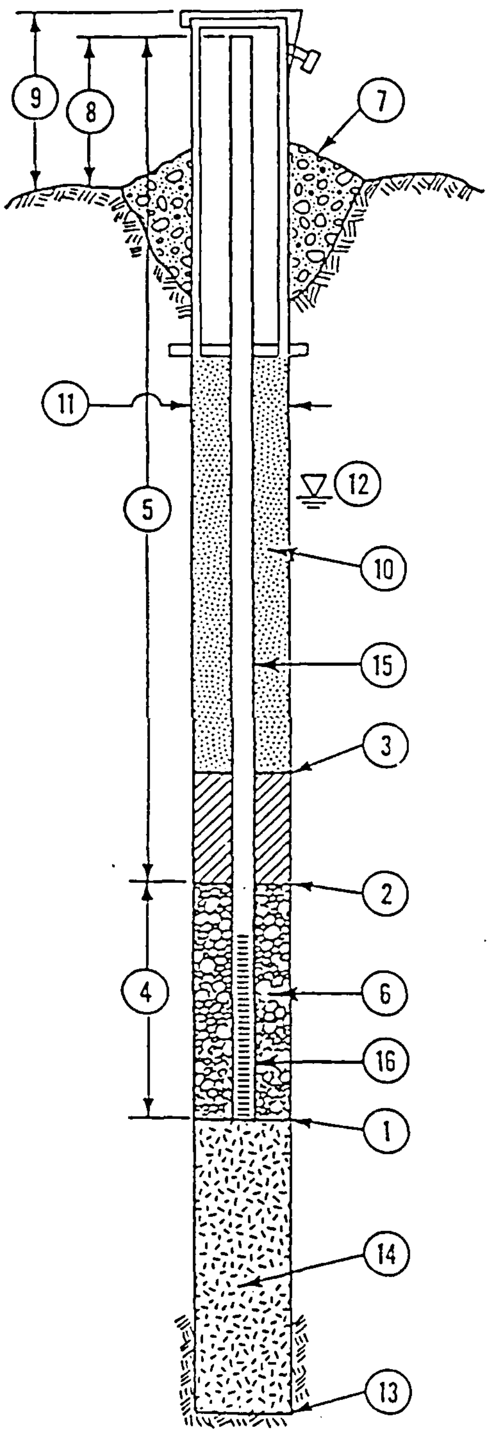
TOP OF WELL CASING ELEVATION 529.06 (pvc)

JOB NUMBER 1016-261

BORING NUMBER GW2-C

DATE 8/14/86

LOCATION Eielson AFB



1. DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 15.5 FEET.*
2. DEPTH TO BOTTOM OF SEAL (IF INSTALLED) 5.5 FEET.*
3. DEPTH TO TOP OF SEAL (IF INSTALLED) 3.5 FEET.*
4. LENGTH OF WELL SCREEN 10 FEET.
   SLOT SIZE 0.010.
5. TOTAL LENGTH OF PIPE 15.56 FEET AT 2 INCH DIAMETER.
6. TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE sand.
7. CONCRETE CAP. YES NO (CIRCLE ONE)
8. HEIGHT OF WELL CASING ABOVE GROUND 0.06 FEET.
9. PROTECTIVE CASING? YES NO (CIRCLE ONE)
   HEIGHT ABOVE GROUND ___ FEET.
   LOCKING CAP? YES NO (CIRCLE ONE)
10. TYPE OF UPPER BACKFILL Cement-bentonite grout
11. BOREHOLE DIAMETER 8 INCHES.
12. DEPTH TO GROUND WATER 7.0 FEET.*
13. TOTAL DEPTH OF BOREHOLE 15.5 FEET.*
14. TYPE OF LOWER BACKFILL —.
15. PIPE MATERIAL PVC.
16. SCREEN MATERIAL PVC.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

APPENDIX E

FIELD RAW DATA

WELL NO. GW-32A STABILIZATION TEST

DATE: 9/14/86 TIME: 1120

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: µmhos/cm	192	195	188	189	199					
pH: ± 0.1 pH unit	6.20	6.15	6.1	6.05	6.05					
Temperature: ± 0.5°C	6.2	5.7	5.2	5.2	5.2					
Color										
Odor of Discharge										

WELL NO. GW32B STABILIZATION TEST

DATE: 9/14/86 TIME: 1530

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: μmhos/cm	256	240	219	240	235	238				
pH: ± 0.1 pH unit	6.1	6.4	6.15	6.1	6.05	6.1				
Temperature: ± 0.5°C	10.0	6.8	5.9	5.5	5.2	5.2				
Color										
Odor of Discharge										

WELL NO. GW-32C STABILIZATION TEST

DATE: 9/14/86 TIME: 1645

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: µmhos/cm	550	480	meter not working							
pH: ± 0.1 pH unit	6.4	6.5	6.4							
Temperature: ± 0.5°C	11.0	9.2	meter not working							
Color	Dark gray									
Odor of Discharge	Slight foul									

WELL NO. GW-32D STABILIZATION TEST

DATE: 9/15/86 TIME: 1050

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	11/4/86 8 0930	11/4/86 9	11/4/86 10
Field Conductivity: µmhos/cm								350	355	355
pH: ± 0.1 pH unit	6.3	6.9	6.9	6.95				7.35	7.45	7.4
Temperature: ± 0.5°C								5.1	4.5	4.2
Color	Dark gray							gray	gray	gray
Odor of Discharge	slight. foul							musty	same	same.

Note: Conductivity & temperature meter inoperable 9/15/86. Re-tested 11/4/86; values above, well volumes 8-10.

WELL NO. GW-32E STABILIZATION TEST

DATE: 9/15/86 TIME: 1230

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	11/14/86 8 1030 →	11/14/86 9	11/14/86 10
Field Conductivity: µmhos/cm								360	362	363
pH: ± 0.1 pH unit	7.1	7.05	7.1					7.6	7.7	7.7
Temperature: ± 0.5°C								4.0	4.0	4.0
Color								gray	gray	gray
Odor of Discharge								musty	same	same

Note: Conductivity + temperature meter inoperable 9/15/86. Re-tested 11/4/86; values above, well volumes 8-10.

WELL NO. GW-32F STABILIZATION TEST

DATE: 9/14/86 TIME: 1005

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: μmhos/cm	112	185	210	232	233	238				
pH: ± 0.1 pH unit	6.0	6.4	6.35	6.5	6.4	6.4				
Temperature: ± 0.5°C	6.5	6.0	6.0	6.0	6.2	6.2				
Color										
Odor of Discharge										

WELL NO. W-7 STABILIZATION TEST

DATE: 9/14/86 TIME: 1345

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: µmhos/cm	312	355	360	359						
pH: ± 0.1 pH unit	6.4	5.95	5.85	5.85						
Temperature: ± 0.5°C	10.5	8.0	7.5	7.5						
Color										
Odor of Discharge										

WELL NO. GW2B STABILIZATION TEST

DATE: 9/13/86 TIME: 1445

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: μmhos/cm	122	115	112	110	125	122	120			
pH: ± 0.1 pH unit	6.1	6.15	6.5	6.4	6.4	6.35	6.35			
Temperature: ± 0.5°C	5.1	3.0	1.2	1.2	1.0	1.2	1.1			
Color										
Odor of Discharge										

WELL NO. GW-2C STABILIZATION TEST

DATE: 9-13-86 TIME: 2030

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: µmhos/cm	102	95	100							
pH: ± 0.1 pH unit	7.2	6.9	6.8							
Temperature: ± 0.5°C	4.0	4.0	4.0							
Color										
Odor of Discharge										

WELL NO. W-8 STABILIZATION TEST

DATE: 9/13/86 TIME: 1815

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: µmhos/cm	212	195	205	204	202					
pH: ± 0.1 pH unit	6.4	6.35	6.4	6.4	6.4					
Temperature: ± 0.5°C	5.2	3.8	2.8	2.7	2.3					
Color										
Odor of Discharge										

WELL NO. W-9 STABILIZATION TEST

DATE: 9/13/86 TIME: 1600

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: μmhos/cm	215	200	202	201						
pH: ± 0.1 pH unit	6.2	6.35	6.35	6.35						
Temperature: ± 0.5°C	5.0	4.0	3.5	3.5						
Color										
Odor of Discharge										

WELL NO. W-10 STABILIZATION TEST

DATE: 9/13/86 TIME: 1150

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Field Conductivity: µmhos/cm	152	143	158	170	178	141				
pH: ± 0.1 pH unit	7.55	7.6	7.7	7.6	7.6	7.6				
Temperature: ± 0.5°C	6.8	7.0	6.8	7.0	6.8	6.8				
Color										
Odor of Discharge										

APPENDIX F

FIELD AND LABORATORY QUALITY CONTROL PROCEDURES

FIELD AND LABORATORY QUALITY CONTROL PROGRAMS

FIELD INVESTIGATION QUALITY CONTROL PROGRAM

The Technical Operations Plan (TOP) presented in Appendix M describes the methods and procedures that were used to accomplish the tasks defined during the Stage 2 investigation at Eielson AFB. Guidelines of the Occupational Safety and Health Administration (OSHA), United States Environmental Protection Agency (USEPA), and USAF, as well as previous investigations at Eielson AFB, were reviewed to select the methods that would be most appropriate for this investigation. The TOP is designed primarily to give guidance to personnel in the field and to ensure that standard methods of investigation are used.

LABORATORY QUALITY CONTROL PROGRAM

UBTL is an accredited laboratory of the American Industrial Hygiene (AIHA) Association (No. 17) and, as such, participates in an extensive interlaboratory proficiency analytical testing program sponsored by the National Institute for Occupational Safety and Health (NIOSH). In addition, UBTL is currently licensed by the Center for Disease Control (CDC) to perform chemical and clinical analyses of biological specimens and is State of Utah/USEPA approved for environmental analyses. The comprehensive internal quality control program at UBTL is detailed as follows.

Introduction

UBTL has implemented an effective system for Quality Control (QC) for samples analyzed from Eielson AFB. Procedures that are employed include:

1. Services of a full-time Quality Control/Quality Assurance Section;
2. Preparation of internal quality control samples;
3. Collection and evaluation of quality control data;
4. Generation of quality control charts; and
5. Instrument calibration and maintenance.

Sample Analyses

At least one blank sample and one reagent blank are included with each set of analyses and processed through the complete analytical procedure in order to detect any contamination in either collection media or reagents. In addition, duplicate analyses are accomplished on a minimum of 10 percent of all samples submitted from the field. Internal quality control samples, generated in the laboratory and

containing known quantities of specified analyte(s), are run at the rate of 10 percent of the total field sample workload. At the completion of the analysis of a sample set, each chemist calculates his results and reports the results on the Analytical Report Form. Results for replicated samples and internal quality control samples are reported on the computer-generated Quality Control Data Sheet. Before the results are submitted to the Group Leader, another peer chemist analyst is assigned to check results for possible errors in the calculations. He must approve results reported on both the quality control sheet and the sample sheet. The Group Leader, after his evaluation of the data, gives the report sheets to the Quality Assurance Specialist (QAS) for his evaluation and implementation of any required action.

Specific steps are followed when any one QC sample result is determined to be out of control in connection with the analysis of a field sample set. QC charts with adjusted control limits of $\pm$ 3 standard deviations will generally be used to determine whether a result is out of control. If QC results are in control, the QAS signs off the report. It is then reviewed by the Section Head for accuracy of the results. Upon final approval of the reports by the QAS and the Section Head, the reports are sent to the sponsor.

The paperwork containing the raw data for a sample set (i.e., chart paper, computer readouts, paper tapes, calibration curves, tables of data, etc.) is collected and placed in an 8½- by 11-inch envelope that has been labeled with sample numbers, analyst, date, and other pertinent information. The envelopes are filed by laboratory number for possible future reference and data retrieval. Raw data for each sample analysis are therefore readily available, if needed.

Quality Control Sample Data Analysis

A record of the preparation of internal QC samples is detailed in the QC log book maintained by the QAS. As appropriate, a set of QC samples is distributed to the chemist along with each sample set at an average rate of at least 10 percent of the submitted samples. The analyses and data evaluations are performed for these QC samples, along with the submitted samples, and results are tabulated on the computer-generated Quality Control Data Sheet. At least duplicate results are reported for each internal QC sample.

QC charts are generated for each analyte through the analysis of QC sample results. Each result is divided by the theoretical value to standardize results so that data from all concentrations can be directly compared for accuracy and precision. When a control data set of N sample results has been accumulated, the following statistics are calculated: mean percent recovery, replicate standard deviation, and set standard deviation. These statistics are then used to determine accuracy and precision QC limits.

The control data set is updated after evaluation of 20 successive QC samples and includes data on the 50 most recent results. Any control sample analysis that is beyond accuracy or precision limits is not used in the subsequent determination of new limits.

External Quality Control Programs

In addition to internally generated QC data, other information concerning QC is provided by the participation of UBTL in four interlaboratory QC programs: NIOSH Proficiency Analytical Testing (PAT) Program; two CDC Blood Lead QC Programs; and State of Utah Environmental Quality Control Program. The PAT Program and the CDC Blood Lead Programs involve the participation of more than 100 laboratories on a nationwide basis. The PAT Program addresses the analysis of filter samples for lead, cadmium, zinc, free silica, and asbestos and the analysis of charcoal tubes for various organic solvents.

Laboratory Data Reduction

A significant fraction of the Chemistry Department's work involves data processing. Mathematical models, based upon analysis of standard solutions or samples, are generated in order to determine the quantity of analyte present in the samples. Considerable time and effort are saved by the utilization of automated data processing procedures. Data processing by the computer can include, for example, calculations, generation of standard calibration curves, mathematical modeling of standard curves, statistical analyses, and the generation of hard copy output. Advantages intrinsic to the use of an automated system include more accurate calculations, immediate and accurate generation of data plots, fewer transcription errors, and no calculation errors after programs have been verified and documented. In general, the types of data that are processed are those derived from the following techniques: atomic absorption and flame emission spectroscopy, gas and liquid chromatography, optical absorbance spectrophotometry, specific ion electrode, fluorescence spectroscopy, and wet chemistry determinations. Similar functions are employed for QC data. In addition, the data system is utilized to store QC data, provide statistical analyses, and generate and update QC charts. The advantage of the provision for statistical analyses and the production of QC charts by automation is that the charts may be easily updated with minimal effort. QC data and any required action may, therefore, be provided on a daily basis.

Reporting Procedures

The analytical data are reported to the sponsor at the completion of each sample set. The report includes the following items:

1. A memorandum describing the sample set; the condition and appearance (i.e., homogeneity, integrity, etc.) of the samples upon receipt at UBTL; the method, equipment, and technique used in the determination; any interferences that were observed; and any unusual circumstances that may have occurred during the analysis. [The limit(s) of detection are also reported.]

2. UBTL Analytical Report Form, including field ID number, laboratory ID number, identification of the analytes, results of each determination, limit(s) of detection, and comments.

3. Other items, such as copies of strip chart recorder output, computer printout sheets, and other raw data (to be included as required).

Instrumentation

Each major equipment item at the UBTL Chemistry Department undergoes a routine preventive maintenance check on a regular schedule. This check is accomplished by a trained engineer. In addition, performance checks are made by the analyst prior to the analysis of each set of samples. This involves the analysis of one or more standards and a comparison of the values obtained with previous results and conditions. This information is recorded in an instrumentation log.

When an instrument or apparatus malfunctions and the problem is not readily corrected, the appropriate Section Head is notified. If it is determined that a visit by the service representative is required, a service call is scheduled and the QAS is notified. Action by the service representative is recorded by the QAS in the Instrument Maintenance Log, and the appropriate customer field and service order forms are filed, by instrument, in the Instrument Maintenance Log Supplement File. In an effort to monitor and maintain instrument specifications, logs for each of the AA spectrophotometers, the gas chromatographs (GC), the X-ray diffractometer (X-ray), and the mass spectrometers (MS) have been provided for the analytical chemists' use each time an analysis is performed. The AA instrumentation logs contain entries for date, analyst, lamp number (if more than one lamp is available), standard concentration (recommended in manual), reading in milliabsorbence units, and a column for when instrumental parameters differ from the recommended conditions listed in the manual. The GC, X-ray, and MS logs contain entries for date, time, analyst, set identification number, and comments on parameters or performance.

Training

UBTL has established a continuing program of training of current personnel with respect to QC procedures. In addition, an intensive program for the training of recently recruited personnel in both analytical methods and techniques and QC policies has been implemented. It is the responsibility of the QAS and the Laboratory Director to train all laboratory personnel.

Results of the Laboratory QC Program

The results of the QC analyses for soil and ground water samples are presented in Appendix H, Analytical Reports.

In general, the laboratory QC program produced analyses of duplicate and spiked samples that were satisfactory. Details of the gas chromatographic columns are presented in the transmittal letter from UBTL in Appendix H.

The presence of trichlorofluoromethane in a number of wells cannot be categorically ascribed to site contamination. The laboratory does not use this material at their facility. The possibility that this parameter may be due to an unknown laboratory, source, or contamination during transport, however, cannot be ruled out. Neither trip blank contained this parameter. At present, the source of this material is in question.

Two exceptions to the acceptable recovery of spike samples are noted in the QC data. Low recovery of DDT in spiked soil samples is attributed to conversion of DDT to DDD and DDE in the soil sample matrix or on the gas chromatographic column. This hypothesis is supported by spike soil samples showing elevated levels of DDD and DDE even though only DDT was spiked. Although the DDT spike recoveries from soil are low (27 and 43 percent), they are within the range of 23 to 134 percent allowed by UBTL's USEPA Contract Laboratory Program contract. Low recoveries were obtained for the lead spikes in water samples from Sites 32 and 1. This factor is attributed to a matrix effect. Because the lead results were near or below the limit of detection, the method of standard additions -- normally employed to clarify matrix effects -- was not performed.

A lapse in holding time for pesticides analysis of soils occurred. Appendix I contains correspondence with USEPA Region X officials regarding the validity of the soils data and the acceptance of the handling procedures. For this reason, it is believed that the pesticides analyses of soils has produced valid data.

APPENDIX G

CHAIN-OF-CUSTODY RECORDS

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Gielson AFB, Fairbanks, AK

Project Title: Eielson AFB

Job No. 1016-261

Field Personnel (Signature): Amy D. Samberg

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
8/13	14:50	B1-D 7.5-9.0, 32	Soil	1	Gielson AFB	
8/12		B1-B 7.5-9.0, 15	↓	↓	↓	
8/12		B1-B 2.5-4.0 19				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Amy Samberg			Maria Simmons	9/2/86	11:35 a.m.	Maria Simmons	9/2/86	3:15 p.m.			

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson AFB, Fairbanks, AK						Field Personnel (Signature): Amy D. Farnberg
Project Title: Eielson AFB, IRP					Job No. 1016-261	
Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
8/13	9:30	B1-A 0-1.5, 2	Soil	1	Eielson AFB	
		B1-A 2.5-4.0, 4				
		B1-A 5.0-6.5, 6				
		B1-A 7.5-9.0, 8				
	10:30	B1-B 0-1.5, 10				
		B1-B 2.5-4.0, 12				
		B1-B 5.0-6.5, 14				
		B1-B 7.5-9.0, 16				
	11:30	B1-C 0-1.5, 18				
		B1-C 2.5-4.0, 20				
		B1-C 5.0-6.5, 22				
		B1-C 7.5-9.0, 24				
	14:00	B1-D 0-1.5, 26				
		B1-D 2.5-4.0, 28				
		B1-D 5.0-6.5, 30				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Amy Farnberg	8/28		Maria Simmons	9/8/86	11:35 a.m.	Maria Simmons	9/8/86	3:15 pm.			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson AFB –

Project Title: Phase II Stage II IRP

Job No.

Field Personnel (Signature): Kay L. Sausaker

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
9-13	14:45	GW-2B	Water	10	Site 2	
9-13	15:45	W-9	Water	10	" 2	
9-13	18:30	W-8	Water	~~10~~ 11 ARS	" 2	
—	—	Trip Blank	Water	2	—	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
J.M. Stanley	9/13/86	2245	M. Simmons	9/15/86 1115		M. Simmons	9/15/86	1420			

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson Air Force Base						Field Personnel (Signature): Kay L. Lauscher
Project Title: Phase II Stage II IRP					Job No. 1016265007	
Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
9-13	11:50	GW-1D	Water	13	Site 1	
9-13	20:30	GW-2C	Water	13	Site 2	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
K. L. Lauscher	9/13/86	10:25 pm	M. Simmons	9/15/86	11:15 am	Maria Simmons	9/15/86	1420			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson Air Force Base

Project Title: Phase II Stage II IRP

Job No: 016-265-007

Field Personnel (Signature): Kay L. Jauscher

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
9-14	11:45	GW-32A/7	Water	11	Site 32	Sampled by Mike Stanley as well
9-14	13:45	W-7/8	Water	11	Site 2	
9-14	10:15	GW-32F/6	Water	11	Site 32	
9-14	4:00	Field QC	Water	8	—	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Kay L. Jauscher	9/14	22:00	M. Simmons	9/15/92	1137	Maria Simmons	9/15/92	1600			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson Airforce Base

Field Personnel (Signature): Kay L. Jauscher

Project Title: Stage II Phase II IRP

Job No. 1016-265-007

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
9-14	17:05	GW32C/10	Water	46	Site 32	
9-14	15:00	GW32B/9	Water	1	" 32	
—	—	Trip Blank	"	9	—	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
K L Jauscher	9/14	19:30	M Simmons	9/15/86	1137	Mario Simmons	9/15/86	1600			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson Air Force Base

Project Title: Phase II Stage II IRP

Job No. 1016-265-007

Field Personnel (Signature): Kay L. Jauscher

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
9-14	15:00	GW-32B/9	Water	11	Site 32	
9-14	17:05	GW-32C/10	Water	22	Site 32	
9-14	—	Trip Blank	"	1	—	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Kay L. Jauscher	9-14	7:30	M. Sennott	9/15/90	1137	Maria Sennott	9/15/90	1600			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client: Eielson Airforce Base

Project Title: Phase II Stage II I.R.P.

Job No. 1016-265-007

Field Personnel (Signature): Kay L. Jauscher

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
9/15	11:15	GW-32 D/11	Water	~~#~~ 11	Site 32	
9/15	12:50	GW32-E/12	Water	~~#~~ 11	Site 32	
–	–	Trip Blank	Water	1	—	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
K. L. Jauscher	9/15	1:30	Fed. Ex.	9/15/86		Fed. Ex.	9/16/86	0915	[illegible]	9/16/86	0915
[illegible]	9/17/86	1600									

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client Eielson AFB, Alaska USAFOEHL

Project Title Phase II Stage 2 IRP (Summer 1987) Job No. 1016-261-007

Field Personnel (Signature) [illegible]

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
7/5/87	12:30	GW-32 A #1	Water	1	Site 32	TDS
"	"	GW-32 A #2				Petro. Hydrocarb.
	"	GW-32 A #3				" " , Trip Blank
	1610	GW-32 B #4				TDS
	"	GW-32 B #5				Petro Hydrocarb. Field QC
	"	GW-32 B #6				Petro Hydrocarb.
	1820	GW-32 C #7				Petro Hydrocarb.
	"	GW-32 C #8				TDS Field QC
	"	GW-32 C #9				TDS
	1935	GW-32 D #10				TDS
	"	GW-32 D #11				Petro. Hydrocarb.
	"	GW-32 D #12				Petro Hydrocarb. LQC
	1440	W-7 #13				TDS LQC
		W-7 #14				TDS
		W-7 #15				Petro Hydro

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
[illegible]	7/5	2155		7/5	2155	stat Express	7/7/87	0945	[illegible]	7/7/87	0945
			[illegible]								

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client Eielson AFB, Alaska USAFOEHL						Field Personnel (Signature)
Project Title Phase II Stage 2 IRP (Summer 1987)					Job No. 1016-261-007	
Date	**Time**	**Sample I.D. No.**	**Sample Type**	**No. of Containers**	**Sampling Site**	**Remarks**
7/7	1000	GW-32E #16	Water	1	Site 32	TDS
7/7	1000	GW-32E #17	"	1	"	Petro. Hydro.
7/7	1114	GW-32F #18	"	1	"	TDS
7/7	1114	GW-32F #19	"	1	"	Petro Hydro
7/7	1114	GW-32F #20	"	1	"	Petro Hydro Lab QC
	1528	GW-2C #21			Site 2	TDS
	1528	GW-2C #22				TDS Lab QC
	1419	GW-2B #23				TDS
	1758	W-9 #24				TDS
	1758	W-9 #25				TDS
	1646	W-8 #26				TDS Field QC (B)
	1646	W-8 #27				TDS
						TDS Trip Blank

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	7/7					Stat Express	7/8/87	1545	am	7/8/87	1545
Relinquished by: (Signature)	**Date**	**Time**	**Received by: (Signature)**	**Date**	**Time**	**Relinquished by: (Signature)**	**Date**	**Time**	**Received by: (Signature)**	**Date**	**Time**
Relinquished by: (Signature)	**Date**	**Time**	**Received by: (Signature)**	**Date**	**Time**	**Relinquished by: (Signature)**	**Date**	**Time**	**Received by: (Signature)**	**Date**	**Time**

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client Eielson AFB, Alaska USAFOEHL

Project Title Phase II Stage 2 IRP (Summer 1987)

Job No. 1016-261-007

Field Personnel (Signature)

Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks
7/2	2000	GW-1, #28	Water	1	Site 1	Pesticides Trip Blank
		GW-1, #29				TDS
		GW-1, #30				Pesticides Lab QC
		GW-1, #31				Petro. hydro.
		GW-1, #32				Pesticides
		GW-1, #33				Pesticides Lab QC

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	7/2					Stat Express	7/4/87	1545		7/4/87	1545
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

APPENDIX H

ANALYTICAL REPORTS

DataChem

May 5, 1987
Refer to: 87D408

Ms. Carol Scholl
Dames & Moore
1550 Northwest Highway
Park Ridge, Illinois 60068

Re: F33615-83-D-4002, Eielson AFB

Dear Ms. Scholl:

In response to your letter concerning comments from the USAF on the Eielson AFB report, the following actions have been taken:

Comment 1.b. All references to "trans-1,3-dichloroethene" have been corrected to read trans-1,2-dichloroethene. Amended report pages are enclosed.

Comment 1.c. The discrepancies in the pesticide data for soil samples have been resolved. Amended report pages are enclosed.

Comment 1.e. DataChem personnel have been unable to identify a source of trichlorofluoromethane (Freon-11) in the laboratory. The possibility remains that it could be a laboratory contaminant; or it could be a trip contaminant. Copies of the chromatograms and quantitative data for the second column runs are enclosed as requested.

Sincerely,

Sim D. Lessley

Sim D. Lessley, Ph.D.
Associate Director

SDL:jno

Enclosure

520 Wakara Way Research Park
Salt Lake City Utah 84108
801 583-3600

UTAH BIOMEDICAL TEST LABORATORY
DIVISION OF DESERET RESEARCH COMPANY
520 WAKARA WAY SALT LAKE CITY UTAH 84108
801 583-3600

January 7, 1986
Refer to: 87D017

Mr. Michael W. Ander
Dames & Moore
1550 Northwest Highway
Park Ridge, Illinois 60068

Re: F33615-83-D-4002, Eielson AFB

Dear Mr. Ander:

Enclosed with this letter is a copy of UBTL's report of the analysis of water and soil samples from the Eielson AFB

Comments upon the analyses are offered in the following paragraphs.

Purgeable Halocarbons in Water by EPA Method 601

A 5 mL sample of water was purged with helium. Any analytes present were collected on a trap consisting of activated charcoal, Tenax, and silica gel. The trap was then heated to 180 °C and the analytes were flushed onto a 8' x 2 mm i.d. glass column packed with 1% SP-1000 on Carbopack B. A temperature program starting at 45 °C and proceeding at 6 °C/minute to 225 °C was used to separate the analytes. A Hall 700A electroconductivity detector in the halogen mode was used for detection and quantification of the analytes.

Any samples that were found to contain target analytes at or above the UBTL method detection limit (MDL) were re-analyzed using an 8' x 2 mm glass second column packed with 0.2% Carbowax 1500 on Carbopack C with temperature programming from 45 °C to 175 °C at 6 °C per minute. A total of 13 of the field samples were confirmed using the second column.

Purgeable Aromatics in Water by EPA Method 602

A 5 mL sample of water was purged with helium. Any analytes present were collected on a trap consisting of activated charcoal, Tenax, and silica gel. The trap was then heated to 180 °C and the analytes were flushed onto a 8' x 2 mm i.d. glass column packed with 1% SP-1000 on Carbopack B. A thermal program starting at 45 °C and proceeding at 6 °C/minute to 225 °C was used to separate the analytes. A photoionization detector equipped with a 10 eV bulb was used for detection and quantification of the analytes.

No second column confirmations were required for the purgeable aromatics analyses.

Pesticides in Water by EPA Method 608

The analysis was performed on a Varian 3700 gas chromatograph equipped with an electron capture detector. A 6' x 2 mm glass column packed with 1.5% SP-2250/1.95% SP-2401 on 100/120 mesh Supelcoport was used isothermally at 200 °C. Nitrogen was used as the carrier gas.

No second column confirmation was required.

Pesticides in Soil by EPA Method 3550/8080

The analysis was performed on a Varian 3700 gas chromatograph equipped with an electron capture detector. A 6' x 2 mm glass column packed with 1.5% SP2250/1.95% SP-2401 on 100/120 mesh Supelcoport was used isothermally at 200 °C. Nitrogen was used as the carrier gas.

The second column confirmation was performed on a Varian Model 3700 gas chromatograph equipped with an electron capture detector. A 6' x 2 mm i.d. glass column packed with 3% OV-101 on 100/120 mesh Gas Chrom-Q was used isothermally at 200 °C with nitrogen as the carrier gas.

Seventeen of the eighteen samples required second column confirmations.

The low recovery of DDT in the spiked soil samples is attributed to conversion of DDT to DDD and DDE in the soil sample matrix or on the GC column. This is supported by the fact that the spiked soil samples showed elevated levels of DDD and DDE even though only DDT was spiked. It should be noted that though the DDT spike recoveries from soil are low (27% and 43%) they are within the range of 23% to 134% allowed by our EPA CLP contract.

Lead in Water by EPA Method 239.2

Low recoveries were observed for the lead spikes in samples from Site 1 and Site 32. In view of the fact that all of the lead results were near or below the limit of detection, the method of standard additions was not performed.

Trip Blanks

The following trip blank data are probably the result of laboratory background rather than trip contamination.

Sample	Petroleum Hydrocarbons	Filterable Residue (TDS)
Trip Blank Rec. 09/15/86	1.4 mg/L	
Trip Blank Rec. 09/16/86	0.5 mg/L	38. mg/L

The original chain of custody sheets are enclosed.

Sincerely,

Sim D. Lessley

Sim D. Lessley, Ph.D.
Associate Director

SDL:jno

Enclosure

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 Site 1	GW-2B Site 2	GW-2C Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86(3)
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)							
Bromodichloromethane	EPA 601 (1)	ug/L	0.35		ND	ND	ND	ND	ND	ND
Bromoform	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND
Bromoethane	EPA 601 (1)	ug/L	0.33		ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	EPA 601 (1)	ug/L	0.46		ND	ND	ND	ND	ND	ND
Chlorobenzene	EPA 601 (1)	ug/L	0.37		ND	ND	ND	ND	ND	ND
Chloroethane	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND
Chloroform	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND
Chloromethane	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND
Dibromochloromethane	EPA 601 (1)	ug/L	0.31		ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	EPA 601 (1)	ug/L	0.29		ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	EPA 601 (1)	ug/L	0.42		ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	EPA 601 (1)	ug/L	0.41		ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	EPA 601 (1)	ug/L	0.33		ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene(t)	EPA 601 (1)	ug/L	0.42		ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	EPA 601 (1)	ug/L	0.20		ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	EPA 601 (1)	ug/L	0.58		ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	EPA 601 (1)	ug/L	0.39		ND	ND	ND	ND	ND	ND
Methylene Chloride	EPA 601 (1)	ug/L	0.34		ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND
Tetrachloroethene	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	EPA 601 (1)	ug/L	0.53		ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	EPA 601 (1)	ug/L	0.51		ND	ND	ND	ND	ND	ND
Trichloroethene	EPA 601 (1)	ug/L	0.60		ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	EPA 601 (1)	ug/L	0.44		5.0	1.2	5.4	5.6	5.4	ND
Vinyl Chloride	EPA 601 (1)	ug/L	0.54		ND	ND	ND	ND	ND	ND

t) Amended 05/04/87

Reviewed and Approved by Amended 5/5/87 L.D. Lesley

"ND" Indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 Site 1	GW-2B Site 2	GW-2C Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86(3)	Trip Blank * One W-10
Purgeable Aromatics	EPA 602 (1)	ug/L	MDL (2)								
Benzene	EPA 602 (1)	ug/L	0.25		ND	ND	ND	ND	ND	ND	
Chlorobenzene	EPA 602 (1)	ug/L	0.35		ND	ND	ND	ND	ND	ND	
1,2-Dichlorobenzene	EPA 602 (1)	ug/L	0.47		ND	ND	ND	ND	ND	ND	
1,3-Dichlorobenzene	EPA 602 (1)	ug/L	0.93		ND	ND	ND	ND	ND	ND	
1,4-Dichlorobenzene	EPA 602 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND	
Ethylbenzene	EPA 602 (1)	ug/L	0.75		ND	ND	ND	ND	ND	ND	
Toluene	EPA 602 (1)	ug/L	0.64		ND	ND	ND	ND	ND	ND	
m-Xylene	EPA 602 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND	
o-Xylene	EPA 602 (1)	ug/L	0.78		ND	ND	ND	ND	ND	ND	
p-Xylene	EPA 602 (1)	ug/L	0.78		ND	ND	ND	ND	ND	ND	
Pesticides	EPA 608 (1)	ug/L	MDL (2)		*						
Aldrin	EPA 608 (1)	ug/L	0.005		ND						ND
alpha-BHC	EPA 608 (1)	ug/L	0.0004		ND						ND
beta-BHC	EPA 608 (1)	ug/L	0.001		ND						ND
delta-BHC	EPA 608 (1)	ug/L	0.002		ND						ND
Lindane	EPA 608 (1)	ug/L	0.004		ND						ND
Chlordane	EPA 608 (1)	ug/L	0.01		ND						ND
4,4'-DDD	EPA 608 (1)	ug/L	0.001		ND						ND
4,4'-DDE	EPA 608 (1)	ug/L	0.001		ND						ND
4,4'-DDT	EPA 608 (1)	ug/L	0.005		ND						ND
Dieldrin	EPA 608 (1)	ug/L	0.003		ND						ND
Endosulfan I	EPA 608 (1)	ug/L	0.008		ND						ND
Endosulfan II	EPA 608 (1)	ug/L	0.004		ND						ND
Endosulfan Sulfate	EPA 608 (1)	ug/L	0.018		ND						ND
Endrin	EPA 608 (1)	ug/L	0.002		ND						ND
Endrin Aldehyde	EPA 608 (1)	ug/L	0.021		ND						ND
Heptachlor	EPA 608 (1)	ug/L	0.01		ND						ND
Heptachlor Epoxide	EPA 608 (1)	ug/L	0.003		ND						ND
Toxaphene	EPA 608 (1)	ug/L	0.1		ND						ND

"ND" indicates that the parameter was not detected.

* Indicates monitor well resampled July, 1987.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 Site 1	GW-28 Site 2	GW-2[illegible] Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86(5)	W-9(FQC) * 1W)
Petroleum Hydrocarbons	EPA 418.1 (4)	mg/L	0.2		ND *	1.6	1.6	ND	1.8	1.4 (5)	
Filterable Residue (TDS)	EPA 160.1 (4)	mg/L	10.		180 *	170 *	200 *	200 *	240 *		12
Lead	EPA 239.2 (4)	mg/L	0.005		ND	ND	ND	ND	ND	ND	
Arsenic	EPA 206.2 (4)	mg/L	0.001			8.	5.	24.	9.	ND	
Cadmium	EPA 200.7 (4)	mg/L	0.004			ND	9.	ND	4.	ND	
Chromium	EPA 200.7 (4)	mg/L	0.007			ND	ND	ND	ND	ND	
Mercury	EPA 245.1 (4)	mg/L	0.0002			ND	ND	ND	ND	ND	
Silver	EPA 200.7 (4)	mg/L	0.007			ND	ND	ND	ND	ND	

"ND" Indicates that the parameter was not detected.
* Indicates monitor well resampled July, 1987.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	GW-32A Site 32	GW-32B Site 32	GW-32C Site 32	GW-32D Site 32	GW-32E Site 32	GW-32F Site 32	W-7 Site 32	Trip Blank 09/16/86(3)
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)									
Bromodichloromethane	EPA 601 (1)	ug/L	0.35		ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND	ND	ND
Bromoethane	EPA 601 (1)	ug/L	0.33		ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	EPA 601 (1)	ug/L	0.46		ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	EPA 601 (1)	ug/L	0.37		ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	EPA 601 (1)	ug/L	0.31		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	EPA 601 (1)	ug/L	0.29		ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	EPA 601 (1)	ug/L	0.42		ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	EPA 601 (1)	ug/L	0.41		ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	EPA 601 (1)	ug/L	0.33		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	EPA 601 (1)	ug/L	0.49		ND	ND	2.0	0.74	0.63	ND	ND	ND
1,2-Dichloroethane	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene(†)	EPA 601 (1)	ug/L	0.42		ND	ND	2.4	ND	ND	ND	ND	ND
1,2-Dichloropropane	EPA 601 (1)	ug/L	0.20		ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	EPA 601 (1)	ug/L	0.58		ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	EPA 601 (1)	ug/L	0.39		ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	EPA 601 (1)	ug/L	0.34		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	EPA 601 (1)	ug/L	0.53		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	EPA 601 (1)	ug/L	0.51		ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	EPA 601 (1)	ug/L	0.60		ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	EPA 601 (1)	ug/L	0.44		21.	2.9(†)	9.0	6.1	4.6	11.	8.7	ND
Vinyl Chloride	EPA 601 (1)	ug/L	0.54		ND	ND	ND	ND	ND	ND	ND	ND

†) Amended 05/04/87

"ND" Indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site:	GW-32A Site 32	GW-32B Site 32	GW-32C Site 32	GW-32D Site 32	GW-32E Site 32	GW-32F Site 32	W-7 Site 32	Trip Blank 09/16/86(3)
Purgeable Aromatics	EPA 602 (1)	ug/L	MDL (2)									
Benzene	EPA 602 (1)	ug/L	0.25		ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	EPA 602 (1)	ug/L	0.35		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	EPA 602 (1)	ug/L	0.47		ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	EPA 602 (1)	ug/L	0.93		ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	EPA 602 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	EPA 602 (1)	ug/L	0.75		ND	ND	ND	ND	ND	ND	ND	ND
Toluene	EPA 602 (1)	ug/L	0.64		ND	ND	ND	ND	ND	ND	ND	ND
m-Xylene	EPA 602 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	EPA 602 (1)	ug/L	0.78		ND	ND	ND	ND	ND	ND	ND	ND
p-Xylene	EPA 602 (1)	ug/L	0.78		ND	ND	ND	ND	ND	ND	ND	ND
Petroleum Hydrocarbons	EPA 418.1 (4)	mg/L	0.2		ND *	0.4 *	0.3 *	0.3 *	ND *	ND *	ND *	
Filterable Residue (TDS)	EPA 160.1 (4)	mg/L	10.		210 *	200 *	460 *	290 *	320 *	240 *	330 *	
TOC	EPA 415.1 (4)	mg/L	1.		33.	110	57.	26.	34.	19.	7.	ND
Total Phosphate	EPA 365.4 (4)	mg/L	0.1		8.1	5.5	4.5	3.6	4.3	4.7	0.3	ND
Nitrate, Nitrite	EPA 353.2 (4)	mg/L	0.01		0.16	0.15	0.22	0.12	0.13	0.11	24.	ND
Lead	EPA 239.2 (4)	mg/L	0.005		0.006	ND	ND	ND	ND	ND	ND	ND

ND" Indicates that the parameter was not detected.
* Indicates monitor well resampled July, 1987.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	Field QC Site 32
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)		
Bromodichloromethane	EPA 601 (1)	ug/L	0.35		ND
Bromoform	EPA 601 (1)	ug/L	0.45		ND
Bromoethane	EPA 601 (1)	ug/L	0.33		ND
Carbon Tetrachloride	EPA 601 (1)	ug/L	0.46		ND
Chlorobenzene	EPA 601 (1)	ug/L	0.37		ND
Chloroethane	EPA 601 (1)	ug/L	0.38		ND
2-Chloroethylvinyl Ether	EPA 601 (1)	ug/L	0.44		ND
Chloroform	EPA 601 (1)	ug/L	0.45		ND
Chloromethane	EPA 601 (1)	ug/L	0.49		ND
Dibromochloromethane	EPA 601 (1)	ug/L	0.31		ND
1,2-Dichlorobenzene	EPA 601 (1)	ug/L	0.29		ND
1,3-Dichlorobenzene	EPA 601 (1)	ug/L	0.42		ND
1,4-Dichlorobenzene	EPA 601 (1)	ug/L	0.41		ND
Dichlorodifluoromethane	EPA 601 (1)	ug/L	0.33		ND
1,1-Dichloroethane	EPA 601 (1)	ug/L	0.49		1.8
1,2-Dichloroethane	EPA 601 (1)	ug/L	0.44		ND
1,1-Dichloroethene	EPA 601 (1)	ug/L	0.49		ND
trans-1,2-Dichloroethene(t)	EPA 601 (1)	ug/L	0.42		2.5
1,2-Dichloropropane	EPA 601 (1)	ug/L	0.20		ND
cis-1,3-Dichloropropene	EPA 601 (1)	ug/L	0.58		ND
trans-1,3-Dichloropropene	EPA 601 (1)	ug/L	0.39		ND
Methylene Chloride	EPA 601 (1)	ug/L	0.34		ND
1,1,2,2-Tetrachloroethane	EPA 601 (1)	ug/L	0.38		ND
Tetrachloroethene	EPA 601 (1)	ug/L	0.38		ND
1,1,1-Trichloroethane	EPA 601 (1)	ug/L	0.53		ND
1,1,2-Trichloroethane	EPA 601 (1)	ug/L	0.51		ND
Trichloroethene	EPA 601 (1)	ug/L	0.60		ND
Trichlorofluoromethane	EPA 601 (1)	ug/L	0.44		4.4
Vinyl Chloride	EPA 601 (1)	ug/L	0.54		ND

t) Amended 05/04/87

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	Field QC Site 32	GW-32B(FQC) 32 *	GW-32C(FQC) 32 *	Trip Blank 32 (GW32A) *	Trip Blank Two (W-8) *
Purgeable Aromatics	EPA 602 (1)	ug/L	MDL (2)						
Benzene	EPA 602 (1)	ug/L	0.25		ND				
Chlorobenzene	EPA 602 (1)	ug/L	0.35		ND				
1,2-Dichlorobenzene	EPA 602 (1)	ug/L	0.47		ND				
1,3-Dichlorobenzene	EPA 602 (1)	ug/L	0.93		ND				
1,4-Dichlorobenzene	EPA 602 (1)	ug/L	0.44		ND				
Ethylbenzene	EPA 602 (1)	ug/L	0.75		ND				
Toluene	EPA 602 (1)	ug/L	0.64		ND				
m-Xylene	EPA 602 (1)	ug/L	0.45		ND				
o-Xylene	EPA 602 (1)	ug/L	0.78		ND				
p-Xylene	EPA 602 (1)	ug/L	0.78		ND				
					ND				
Petroleum Hydrocarbons	EPA 418.1 (4)	mg/L	0.2			0.2		ND	
Filterable Residue (TDS)	EPA 160.1 (4)	mg/L	10.						
TOC	EPA 415.1 (4)	mg/l	1.		75.		470		14
Total Phosphate	EPA 365.4 (4)	mg/l	0.1		4.7				
Nitrate, Nitrite	EPA 353.2 (4)	mg/l	0.01		0.50				
Lead	EPA 239.2 (4)	mg/L	0.005		0.005				

(1) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," Federal Register, Volume 49, Number 209, Friday, October 26, 1984.
(2) Determined according to the procedure in Federal Register, Friday, October 26, 1984, Part VIII.
(3) Date received by UBTL.
(4) "Methods for Chemical Analysis of Water and Wastes," EPA Manual 600/4-79-020, USEPA, March 1983.
(5) Attributed to laboratory background.

"ND" indicates that the parameter was not detected.
* Indicates monitor well resampled July, 1987.

H-11

UBTL ANALYTICAL REPORT

Eielson AFB - Soil Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	B1A0-1.5 Site 1	B1A2.5-4 Site 1	B1A5-6.5 Site 1	B1A7.5-9 Site 1	B1B0-1.5 Site 1	B1B2.5-4 Site 1	B1B2.5-4 Site 1	B1B5-6.5 Site 1
Pesticides	EPA SW3550/8080 (1)	mg/kg	MDL (3)									
Aldrin	EPA SW3550/8080 (1)	mg/kg	0.005		ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	EPA SW3550/8080 (1)	mg/kg	0.0001		ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND	ND	ND	ND	ND	ND	ND
Lindane	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	EPA SW3550/8080 (1)	mg/kg	0.001		ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	EPA SW3550/8080 (1)	mg/kg	0.0002		0.002	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	EPA SW3550/8080 (1)	mg/kg	0.0005		0.004(†)	ND	ND	ND	0.003(†)	0.001(†)	ND(†)	0.002(†)
4,4'-DDT	EPA SW3550/8080 (1)	mg/kg	0.0005		0.007(†)	ND(†)	ND(†)	ND	0.005(†)	0.001(†)	0.003(†)	0.02
Dieldrin	EPA SW3550/8080 (1)	mg/kg	0.0003		ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	EPA SW3550/8080 (1)	mg/kg	0.0008		ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	EPA SW3550/8080 (1)	mg/kg	0.0018		ND	ND	ND	ND	ND	ND	ND	ND
Endrin	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	EPA SW3550/8080 (1)	mg/kg	0.0021		ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	EPA SW3550/8080 (1)	mg/kg	0.001		ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	EPA SW3550/8080 (1)	mg/kg	0.0003		ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	EPA SW3550/8080 (1)	mg/kg	0.01		ND	ND	ND	ND	ND	ND	ND	ND
Moisture	ASTM D2216-71 (2)	%	1.0		6.9	5.1	2.8	15.	9.0	8.0	8.7	9.7

(†) Amended 05/04/87

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	B1B7.5-9 Site 1	B1B7.5-9 Site 1	B1C0-1.5 Site 1	B1C2.5-4 Site 1	B1C5-6.5 Site 1	B1C7.5-9 Site 1	B1D0-1.5 Site 1	B1D2.5-4 Site 1
Pesticides	EPA SW3550/8080 (1)	mg/kg	MDL (3)									
Aldrin	EPA SW3550/8080 (1)	mg/kg	0.005		ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	EPA SW3550/8080 (1)	mg/kg	0.0001		ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND	ND	ND	ND	ND	ND	ND
Lindane	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	EPA SW3550/8080 (1)	mg/kg	0.001		ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND	0.003	ND	ND	ND	ND	ND
4,4'-DDE	EPA SW3550/8080 (1)	mg/kg	0.0005		ND	0.001(†)	0.001(†)	ND	ND(†)	0.001(†)	ND(†)	ND
4,4'-DDT	EPA SW3550/8080 (1)	mg/kg	0.0005		0.003(†)	0.002(†)	0.002(†)	ND(†)	0.001(†)	0.004(†)	0.003(†)	0.001(†)
Dieldrin	EPA SW3550/8080 (1)	mg/kg	0.0003		ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan I	EPA SW3550/8080 (1)	mg/kg	0.0008		ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate	EPA SW3550/8080 (1)	mg/kg	0.0018		ND	ND	ND	ND	ND	ND	ND	ND
Endrin	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	EPA SW3550/8080 (1)	mg/kg	0.0021		ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	EPA SW3550/8080 (1)	mg/kg	0.001		ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide	EPA SW3550/8080 (1)	mg/kg	0.0003		ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	EPA SW3550/8080 (1)	mg/kg	0.01		ND	ND	ND	ND	ND	ND	ND	ND
Moisture	ASTM D2216-71 (2)	%	1.0		24.	14.	5.9	9.2	4.6	17.	9.7	5.6

†) Amended 05/04/87

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Soil Samples

Parameter	Method	Units	Detection Limit	Field #: Site :	B1D5-6.5 Site 1	B1D7.5-9 Site 1
Pesticides	EPA SW3550/8080 (1)	mg/kg	MDL (3)			
Aldrin	EPA SW3550/8080 (1)	mg/kg	0.005		ND	ND
alpha-BHC	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND
beta-BHC	EPA SW3550/8080 (1)	mg/kg	0.0001		ND	ND
delta-BHC	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND
Lindane	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND
Chlordane	EPA SW3550/8080 (1)	mg/kg	0.001		ND	ND
4,4'-DDD	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND
4,4'-DDE	EPA SW3550/8080 (1)	mg/kg	0.0005		ND	ND
4,4'-DDT	EPA SW3550/8080 (1)	mg/kg	0.0005		ND(†)	ND(†)
Dieldrin	EPA SW3550/8080 (1)	mg/kg	0.0003		ND	ND
Endosulfan I	EPA SW3550/8080 (1)	mg/kg	0.0008		ND	ND
Endosulfan II	EPA SW3550/8080 (1)	mg/kg	0.0004		ND	ND
Endosulfan Sulfate	EPA SW3550/8080 (1)	mg/kg	0.0018		ND	ND
Endrin	EPA SW3550/8080 (1)	mg/kg	0.0002		ND	ND
Endrin Aldehyde	EPA SW3550/8080 (1)	mg/kg	0.0021		ND	ND
Heptachlor	EPA SW3550/8080 (1)	mg/kg	0.001		ND	ND
Heptachlor Epoxide	EPA SW3550/8080 (1)	mg/kg	0.0003		ND	ND
Toxaphene	EPA SW3550/8080 (1)	mg/kg	0.01		ND	ND
Moisture	ASTM D2216-71 (2)	%	1.0		2.7	13.

(1) EPA SW-846, second edition, July 1982

(2) ASTM D 2216-71, "Laboratory Determination of Moisture Content of Soil."

(3) Determined according to the procedure in Federal Register, Friday, October 26, 1986, Part VIII.

†) Amended 05/04/87

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Holding Time Summary

Parameter	Method	Field #: Site :	GW-1 One	GW-2B Site 2	GW-2C Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86 (3)
Sampling Date			09/13/86 07/07/87*	09/13/86 07/07/87*	09/13/86 07/07/87*	09/13/86 07/07/87*	09/13/86 07/07/87*	09/13/86
Purgeable Halocarbons	EPA 601 (1)							
Date Analyzed			09/15/86	09/15/86	09/15/86	09/15/86	09/15/86	09/15/86
Elapsed Time			2 days	2 days	2 days	2 days	2 days	2 days
Purgeable Aromatics	EPA 602 (1)							
Date Analyzed			09/15/86	09/15/86	09/15/86	09/15/86	09/15/86	09/15/86
Elapsed Time			2 days	2 days	2 days	2 days	2 days	2 days
Pesticides	EPA 608 (1)							
Date Extracted			07/09/87 *					
Elapsed Time			2 days					
Date Analyzed			07/14/87					
Elapsed Time			4 days					
Petroleum Hydrocarbons	EPA 418.1 (2)							
Date Analyzed			07/14/87 *					
Elapsed Time			7 days					
Filterable Residue (TDS)	EPA 160.1 (2)							
Date Analyzed			07/14/87 *	07/13/87 *	07/13/87 *	07/13/87 *	07/13/87 *	
Elapsed Time			7 days	6 days	6 days	6 days	6 days	
Lead	EPA 239.2 (2)							
Date Analyzed			09/23/86	11/25/86	11/25/86	11/25/86	11/25/86	11/25/86
Elapsed Time			10 days	73 days	73 days	73 days	73 days	73 days

* Indicates monitor well resampled July, 1987.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Holding Time Summary

Parameter	Method	Field #: / Site :	W-10 Site 1	GW-2B Site 2	GW-2C Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86 (3)	Trip Blank One(W-10) *
Sampling Date			09/13/86	09/13/86	09/13/86	09/13/86	09/13/86	09/13/86	07/07/87
Arsenic	EPA 206.2 (2)								
Date Analyzed				12/01/86	12/01/86	12/01/86	12/01/86	12/01/86	
Elapsed Time				79 days	79 days	79 days	79 days	79 days	
Cadmium	EPA 200.7 (2)								
Date Analyzed				12/01/86	12/01/86	12/01/86	12/01/86	12/01/86	
Elapsed Time				79 days	79 days	79 days	79 days	79 days	
Chromium	EPA 200.7 (2)								
Date Analyzed				12/01/86	12/01/86	12/01/86	12/01/86	12/01/86	
Elapsed Time				79 days	79 days	79 days	79 days	79 days	
Mercury	EPA 245.1 (2)								
Date Analyzed				09/25/86	09/25/86	09/25/86	09/25/86	09/25/86	
Elapsed Time				12 days	12 days	12 days	12 days	12 days	
Silver	EPA 200.7 (2)								
Date Analyzed				12/01/86	12/01/86	12/01/86	12/01/86	12/01/86	
Elapsed Time				79 days	79 days	79 days	79 days	79 days	
Pesticides	EPA 608 (1)								
Date Extracted									
Elapsed Time									07/09/87
Date Analyzed									2 days
Elapsed Time									07/14/87
									5 days

[redacted] Indi[redacted]es [redacted]nitor well resampled July, 1987.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Holding Time Summary

Parameter	Method	Field #: / Site :	GW-32A Site 32	GW-32B Site 32	GW-32C Site 32	GW-32D Site 32	GW-32E Site 32	GW-32F Site 32	W-7 Site 32	Trip Blank 09/16/86 (3)
Sampling Date			09/14/86 07/05/87*	09/14/86 07/05/87*	09/14/86 07/05/87 *	09/15/86 07/05/87 *	09/15/86 07/07/87*	09/14/86 07/07/87 *	09/14/86 07/05/87*	09/14/86
Purgeable Halocarbons	EPA 601 (1)									
Date Analyzed			09/16/86	09/16/86	09/16/86	09/17/86	09/17/86	09/16/86	09/16/86	09/16/86
Elapsed Time			2 days	2 days	2 days	2 days	2 days	2 days	2 days	2 days
Purgeable Aromatics	EPA 602 (1)									
Date Analyzed			09/16/86	09/16/86	09/16/86	09/17/86	09/17/86	09/16/86	09/16/86	09/16/86
Elapsed Time			2 days	2 days	2 days	2 days	2 days	2 days	2 days	2 days
Petroleum Hydrocarbons	EPA 418.1 (2)									
Date Analyzed			07/13/87*	07/13/87*	07/13/87 *	07/13/87 *	07/13/87*	07/13/87*	07/13/87*	
Elapsed Time			8 days	8 days	8 days	8 days	6 days	6 days	8 days	
Filterable Residue (TDS)	EPA 160.1 (2)									
Date Analyzed			07/09/87*	07/09/87*	07/09/87 *	07/09/87*	07/13/87*	07/13/87*	07/09/87*	
Elapsed Time			4 days	4 days	4 days	4 days	6 days	6 days	4 days	
TOC	EPA 415.1 (2)									
Date Analyzed			10/10/86	10/10/86	10/10/86	10/10/86	10/10/86	10/10/86	10/10/86	10/10/86
Elapsed Time			26 days	26 days	26 days	25 days	25 days	26 days	26 days	26 days
Total Phosphate	EPA 365.4 (2)									
Date Analyzed			10/03/86	10/03/86	10/03/86	10/03/86	10/03/86	10/03/86	10/03/86	10/03/86
Elapsed Time			19 days	19 days	19 days	18 days	18 days	19 days	19 days	19 days
Nitrate, Nitrite	EPA 353.2 (2)									
Date Analyzed			09/30/86	09/30/86	09/30/86	09/30/86	09/30/86	09/30/86	09/30/86	09/30/86
Elapsed Time			16 days	16 days	16 days	15 days	15 days	16 days	16 days	16 days
Lead	EPA 239.2 (2)									
Date Analyzed			09/23/86	09/23/86	09/23/86	09/23/86	09/23/86	09/23/86	09/23/86	09/23/86
Elapsed Time			9 days	9 days	9 days	8 days	8 days	9 days	9 days	9 days

* Indicates monitor well resampled July, 1987.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Holding Time Summary

Parameter	Method	Field #: Site :	Field QC Site 32	GW-32B(FQC)* Thirty Two	GW-32C(FQC)* Thirty Two	Trip Blank* 32(GW-32A)	Trip Blank* Two(W-8)	W-9(FQC)* Two
Sampling Date			09/15/86	07/05/87	07/05/87	07/05/87	07/07/87	07/07/87
Purgeable Halocarbons	EPA 601 (1)							
Date Analyzed			09/16/86					
Elapsed Time			2 days					
Purgeable Aromatics	EPA 602 (1)							
Date Analyzed			09/16/86					
Elapsed Time			2 days					
Petroleum Hydrocarbons	EPA 418.1 (2)							
Date Analyzed				07/13/87		07/13/87		
Elapsed Time				8 days		8 days		
Filterable Residue (TDS)	EPA 160.1 (2)							
Date Analyzed					07/09/87		07/13/87	07/13/87
Elapsed Time					4 days		6 days	6 days
TOC	EPA 415.1 (2)							
Date Analyzed			10/10/86					
Elapsed Time			26 days					
Total Phosphate	EPA 365.4 (2)							
Date Analyzed			10/03/86					
Elapsed Time			19 days					
Nitrate, Nitrite	EPA 353.2 (2)							
Date Analyzed			09/30/86					
Elapsed Time			16 days					
Lead	EPA 239.2 (2)							
Date Analyzed			09/23/86					
Elapsed Time			9 days					

H-18

(1) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," Federal Register, Volume 49, Number 209, Friday, October 26, 1984.
(2) "Methods for Chemical Analysis of Water and Wastes," EPA Manual 600/4-79-020, USEPA, March 1983.
(3) Date received by UBTL.
* Ind[illegible]tes [illegible]ito [illegible]ll [illegible]ampl[illegible] July 1987

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Holding Time Summary

Parameter	Method	Field #: / Site :	B1A0-1.5 Site 1	B1A2.5-4 Site 1	B1A5-6.5 Site 1	B1A7.5-9 Site 1	B1B0-1.5 Site 1	B1B2.5-4 Site 1	B1B2.5-4 Site 1	B1B5-6.5 Site 1
Sampling Date			08/12/86	08/12/86	08/12/86	08/12/86	08/12/86	08/12/86	08/12/86	08/12/86
Pesticides	EPA SW3550/8080									
Date Extracted			09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/05/86	09/04/86
Elapsed Time			23 days	23 days	23 days	23 days	23 days	23 days	24 days	23 days
Date Analyzed			09/12/86	09/12/86	09/12/86	09/12/86	09/12/86	09/12/86	09/12/86	09/12/86
Elapsed Time			8 days	8 days	8 days	8 days	8 days	8 days	7 days	8 days
Moisture	ASTM D2216-71									
Date Analyzed			09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86
Elapsed Time			23 days	23 days	23 days	23 days	23 days	23 days	23 days	23 days

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Holding Time Summary

Parameter	Method	Field #: / Site :	B1B7.5-9 Site 1	B1B7.5-9 Site 1	B1C0-1.5 Site 1	B1C2.5-4 Site 1	B1C5-6.5 Site 1	B1C7.5-9 Site 1	B1D0-1.5 Site 1	B1D2.5-4 Site 1
Sampling Date			08/12/86	08/12/86	08/12/86	08/12/86	08/12/86	08/12/86	08/12/86	08/12/86
Pesticides	EPA SW3550/8080									
Date Extracted			09/04/86	09/05/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/05/86
Elapsed Time			23 days	24 days	23 days	23 days	23 days	23 days	23 days	24 days
Date Analyzed			09/12/86	09/12/86	09/12/86	09/12/86	09/12/86	09/12/86	09/12/86	09/12/86
Elapsed Time			8 days	7 days	8 days	8 days	8 days	8 days	8 days	7 days
Moisture	ASTM D2216-71									
Date Analyzed			09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86	09/04/86
Elapsed Time			23 days	23 days	23 days	23 days	23 days	23 days	23 days	23 days

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Holding Time Summary

Parameter	Method	Field #:	B105-6.5	B107.5-9
		Site :	Site 1	Site 1
Sampling Date			08/12/86	08/12/86
Pesticides	EPA SW3550/8080			
Date Extracted			09/05/86	09/05/86
Elapsed Time			24 days	24 days
Date Analyzed			09/12/86	09/12/86
Elapsed Time			7 days	7 days
Moisture	ASTM D2216-71			
Date Analyzed			09/04/86	09/04/86
Elapsed Time			23 days	23 days

UBTL QUALITY CONTROL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Spiked Sample	Initial Value	Spike Conc.	Percent Recovered	Split Sample	First Value	Second Value	Method Blank
Pesticides	EPA 608 (3)	ug/L	MDL (2)								
Aldrin	EPA 608 (3)	ug/L	0.005	W-10	ND	0.1	110%	W-10	ND	ND	ND
alpha-BHC	EPA 608 (3)	ug/L	0.0004					W-10	ND	ND	ND
beta-BHC	EPA 608 (3)	ug/L	0.001					W-10	ND	ND	ND
delta-BHC	EPA 608 (3)	ug/L	0.002					W-10	ND	ND	ND
Lindane	EPA 608 (3)	ug/L	0.004	W-10	ND	0.1	120%	W-10	ND	ND	ND
Chlordane	EPA 608 (3)	ug/L	0.01					W-10	ND	ND	ND
4,4'-DDD	EPA 608 (3)	ug/L	0.001					W-10	ND	ND	ND
4,4'-DDE	EPA 608 (3)	ug/L	0.001					W-10	ND	ND	ND
4,4'-DDT	EPA 608 (3)	ug/L	0.005	W-10	ND	0.25	95%	W-10	ND	ND	ND
Dieldrin	EPA 608 (3)	ug/L	0.003	W-10	ND	0.25	100%	W-10	ND	ND	ND
Endosulfan I	EPA 608 (3)	ug/L	0.008					W-10	ND	ND	ND
Endosulfan II	EPA 608 (3)	ug/L	0.004					W-10	ND	ND	ND
Endosulfan Sulfate	EPA 608 (3)	ug/L	0.018					W-10	ND	ND	ND
Endrin	EPA 608 (3)	ug/L	0.002	W-10	ND	0.25	100%	W-10	ND	ND	ND
Endrin Aldehyde	EPA 608 (3)	ug/L	0.021					W-10	ND	ND	ND
Heptachlor	EPA 608 (3)	ug/L	0.01	W-10	ND	0.1	140%	W-10	ND	ND	ND
Heptachlor Epoxide	EPA 608 (3)	ug/L	0.003					W-10	ND	ND	ND
Toxaphene	EPA 608 (3)	ug/L	0.1					W-10	ND	ND	ND
Purgeable Halocarbons	EPA 601 (3)	ug/L	MDL (2)								
Chloroform	EPA 601 (3)	ug/L	0.45	GW-20	ND	20.	96%	GW-20	ND	ND	ND
				GW32	ND	20.	99%	GW320	ND	ND	
1,1-Dichloroethane	EPA 601 (3)	ug/L	0.49					GW-20	ND	ND	ND
								GW320	2.1	2.0	
Tetrachloroethene	EPA 601 (3)	ug/L	0.38	GW-20	ND	20.	98%	GW-20	ND	ND	ND
				GW320	ND	20.	86%	GW320	ND	ND	
1,1,1-Trichloroethane	EPA 601 (3)	ug/L	0.55	GW-20	ND	20.	82%	GW-20	ND	ND	ND
				GW320	ND	20.	102%	GW320	ND	ND	
Trichloroethene	EPA 601 (3)	ug/L	0.60	GW-20	ND	20.	100%	GW-20	ND	ND	ND
				GW320	ND	20.	90%	GW320	ND	ND	
Trichlorofluoromethane	EPA 601 (3)	ug/L	0.44					GW-20	5.4	4.4	ND
								GW320	9.1	6.4	

"ND" indicates that the parameter was not detected.

DATACHEM QUALITY CONTROL REPORT
Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Spiked Sample *	Initial Value *	Spike Conc. *	Percent Recovered *	Split Sample *	First Value *	Second Value *	Method Blank
Pesticides	EPA 608 (1)	ug/L	MDL (2)								
Aldrin	EPA 608 (1)	ug/L	0.005	W-10	ND	0.02	85%	W-10	ND	ND	ND
alpha-BHC	EPA 608 (1)	ug/L	0.004					W-10	ND	ND	ND
beta-BHC	EPA 608 (1)	ug/L	0.001					W-10	ND	ND	ND
delta-BHC	EPA 608 (1)	ug/L	0.002					W-10	ND	ND	ND
Lindane	EPA 608 (1)	ug/L	0.004	W-10	ND	0.02	90%	W-10	ND	ND	ND
Chlordane	EPA 608 (1)	ug/L	0.01					W-10	ND	ND	ND
4,4'-DDD	EPA 608 (1)	ug/L	0.001					W-10	ND	ND	ND
4,4'-DDE	EPA 608 (1)	ug/L	0.001					W-10	ND	ND	ND
4,4'-DDT	EPA 608 (1)	ug/L	0.005	W-10	ND	0.05	98%	W-10	ND	ND	ND
Dieldrin	EPA 608 (1)	ug/L	0.003	W-10	ND	0.05	86%	W-10	ND	ND	ND
Endosulfan I	EPA 608 (1)	ug/L	0.008					W-10	ND	ND	ND
Endosulfan II	EPA 608 (1)	ug/L	0.004					W-10	ND	ND	ND
Endosulfan Sulfate	EPA 608 (1)	ug/L	0.018					W-10	ND	ND	ND
Endrin	EPA 608 (1)	ug/L	0.002	W-10	ND	0.05	92%	W-10	ND	ND	ND
Endrin Aldehyde	EPA 608 (1)	ug/L	0.021					W-10	ND	ND	ND
Heptachlor	EPA 608 (1)	ug/L	0.01	W-10	ND	0.02	85%	W-10	ND	ND	ND
Heptachlor Epoxide	EPA 608 (1)	ug/L	0.003					W-10	ND	ND	ND
Toxaphene	EPA 608 (1)	ug/L	0.01					W-10	ND	ND	ND

"ND" indicates that the parameter was not detected.
* Indicates monitor well resampled July, 1987.

UBTL QUALITY CONTROL REPORT

Eielson AFB - Water Samples

Parameter	Method	Units	Detection Limit	Spiked Sample	Initial Value	Spike Conc.	Percent Recovered	Split Sample	First Value	Second Value	Method Blank
Purgeable Aromatics	EPA 602 (3)	ug/L	MDL (2)								
Benzene	EPA 602 (3)	ug/L	0.25	GW-2C	ND	20.	105%	GW-2C	ND	ND	ND
				GW32C	ND	20.	92%	GW32C	ND	ND	
Toluene	EPA 602 (3)	ug/L	0.64	GW-2C	ND	20.	94%	GW-2C	ND	ND	ND
				GW32C	ND	20.	94%	GW32C	ND	ND	
Chlorobenzene	EPA 602 (3)	ug/L	0.37	GW-2C	ND	20.	97%				ND
				GW32C	ND	20.	79%				
Total Organic Carbon	EPA 415.1 (4)	mg/L	1.	Field QC	4.	4.	118%				ND
Total Phosphate	EPA 365.4 (4)	mg/L	0.1	W-7	0.3	0.2	85%	GW32D	3.6	3.6	ND
Nitrate, Nitrite	EPA 353.2 (4)	mg/L	0.01	Field QC	0.50	0.2	111%				ND
				GW32D	0.12	0.1	108%				
Lead	EPA 239.2 (4)	mg/L	0.005	GW32A	0.006	0.048	30%				ND
				W-10	ND	0.048	42%				
				GW32D	ND	0.048	49%				
				GW-2C	ND	0.099	98%				
Arsenic	EPA 206.2 (4)	mg/L	0.001	GW-2C	0.005	0.048	114%				
Cadmium	EPA 200.7 (4)	mg/L	0.004	Lab QC	ND	0.025	96%				ND
				GW-2C	0.009	0.094	89%				
Chromium	EPA 200.7 (4)	mg/L	0.007	Lab QC	ND	0.025	104%				ND
				GW-2C	ND	0.098	97%				
Silver	EPA 200.7 (4)	mg/L	0.007	Lab QC	ND	0.025	101%				ND
				GW-2C	ND	0.025	92%				

"ND" indicates that the parameter was not detected.

UBTL QUALITY CONTROL REPORT
Eielson AFB - Soil Samples

Parameter	Method	Units	Detection Limit	Spiked Sample	Initial Value	Spike Conc.	Percent Recovered	Split Sample	First Value	Second Value	Method Blank
Pesticides	EPA SW3550/8080 (1)	ug/g	MDL (2)								
Aldrin	EPA SW3550/8080 (1)	ug/g	0.005	B1A0-1.5	ND	0.04	75%	B1A0-1.5	ND	ND	ND
				B1B2.5-4	ND	0.04	75%	B1B2.5-4	ND	ND	
alpha-BHC	EPA SW3550/8080 (1)	ug/g	0.0004					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
beta-BHC	EPA SW3550/8080 (1)	ug/g	0.0001					B1A0-1.5	ND	ND	ND
								B1A2-5.4	ND	ND	
delta-BHC	EPA SW3550/8080 (1)	ug/g	0.0002					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
Lindane	EPA SW3550/8080 (1)	ug/g	0.0004	B1A0-1.5	ND	0.04	75%	B1A0-1.5	ND	ND	ND
				B1B2.5-4	ND	0.04	75%	B1B2.5-4	ND	ND	
Chlordane	EPA SW3550/8080 (1)	ug/g	0.001					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
4,4'-DDD	EPA SW3550/8080 (1)	ug/g	0.0002					B1A0-1.5	0.002	0.002	ND
								B1B2.5-4	ND	0.001	
4,4'-DDE	EPA SW3550/8080 (1)	ug/g	0.0005					B1A0-1.5	0.04	0.005	ND
								B1B2.5-4	0.01	0.001	
4,4'-DDT	EPA SW3550/8080 (1)	ug/g	0.0005	B1A0-1.5	0.07	0.1	27%	B1A0-1.5	0.07	0.08	ND
				B1B2.5-4	0.03	0.1	43%	B1B2.5-4	0.03	0.03	
Dieldrin	EPA SW3550/8080 (1)	ug/g	0.001	B1A0-1.5	ND	0.1	70%	B1A0-1.5	ND	ND	ND
				B1B2.5-4	ND	0.1	70%	B1B2.5-4	ND	ND	
Endosulfan I	EPA SW3550/8080 (1)	ug/g	0.0008					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
Endosulfan II	EPA SW3550/8080 (1)	ug/g	0.0004					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
Endosulfan Sulfate	EPA SW3550/8080 (1)	ug/g	0.0018					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
Endrin	EPA SW3550/8080 (1)	ug/g	0.0002	B1A0-1.5	ND	0.1	70%	B1A0-1.5	ND	ND	ND
				B1B2.5-4	ND	0.1	70%	B1B2.5-4	ND	ND	
Endrin Aldehyde	EPA SW3550/8080 (1)	ug/g	0.0021					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	

"ND" indicates that the parameter was not detected.

UBTL QUALITY CONTROL REPORT

Eielson AFB - Soil Samples

Parameter	Method	Units	Detection Limit	Spiked Sample	Initial Value	Spike Conc.	Percent Recovered	Split Sample	First Value	Second Value	Method Blank
Pesticides (continued)	EPA SW3550/8080 (1)	ug/g	MDL (2)								
Heptachlor	EPA SW3550/8080 (1)	ug/g	0.001	B1A0-1.5	ND	0.04	100%	B1A0-1.5	ND	ND	ND
				B1B2.5-4	ND	0.04	100%	B1B2.5-4	ND	ND	
Heptachlor Epoxide	EPA SW3550/8080 (1)	ug/g	0.0005					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	
Toxaphene	EPA SW3550/8080 (1)	ug/g	0.01					B1A0-1.5	ND	ND	ND
								B1B2.5-4	ND	ND	

(1) Test Methods for Evaluating Solid Waste Physical/Chemical Methods," SW-846, Second Edition, USEPA, 1984.

(2) Determined according to the procedure in Federal Register, Friday, October 26, 1984, Part VIII.

(3) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," Federal Register, Volume 49, Number 209, Friday, October 26, 1984.

(4) "Methods for Chemical Analysis of Water and Wastes," EPA Manual 600/4-79-020, USEPA, March 1983.

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 Site 1	GW-2B Site 2	GW-2C Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86(3)
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)							
Bromodichloromethane (f)	EPA 601 (1)	ug/L	0.35		ND	ND	ND	ND	ND	ND
Bromodichloromethane (s)	EPA 601 (1)	ug/L	0.35		NEG	NEG	NEG	NEG	NEG	NEG
Bromoform (f)	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND
Bromoform (s)	EPA 601 (1)	ug/L	0.45		NEG	NEG	NEG	NEG	NEG	NEG
Bromoethane (f)	EPA 601 (1)	ug/L	0.63		ND	ND	ND	ND	ND	ND
Bromoethane (s)	EPA 601 (1)	ug/L	0.63		NEG	NEG	NEG	NEG	NEG	NEG
Carbon Tetrachloride (f)	EPA 601 (1)	ug/L	0.46		ND	ND	ND	ND	ND	ND
Carbon Tetrachloride (s)	EPA 601 (1)	ug/L	0.46		NEG	NEG	NEG	NEG	NEG	NEG
Chlorobenzene (f)	EPA 601 (1)	ug/L	0.37		ND	ND	ND	ND	ND	ND
Chlorobenzene (s)	EPA 601 (1)	ug/L	0.37		NEG	NEG	NEG	NEG	NEG	NEG
Chloroethane (f)	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND
Chloroethane (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG	NEG	NEG	NEG	NEG
2-Chloroethylvinyl Ether (f)	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether (s)	EPA 601 (1)	ug/L	0.44		NEG	NEG	NEG	NEG	NEG	NEG
Chloroform (f)	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND
Chloroform (s)	EPA 601 (1)	ug/L	0.45		NEG	NEG	NEG	NEG	NEG	NEG
Chloromethane (f)	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND
Chloromethane (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG	NEG	NEG	NEG	NEG
Dibromochloromethane (f)	EPA 601 (1)	ug/L	0.31		ND	ND	ND	ND	ND	ND
Dibromochloromethane (s)	EPA 601 (1)	ug/L	0.31		NEG	NEG	NEG	NEG	NEG	NEG

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 Site 1	GW-2B Site 2	GW-2C Site 2	W-8 Site 2	W-9 Site 2	Trip Blank 09/15/86(3)
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)							
1,2-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.29		ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.29		NEG	NEG	NEG	NEG	NEG	NEG
1,3-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.42		ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.42		NEG	NEG	NEG	NEG	NEG	NEG
1,4-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.41		ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.41		NEG	NEG	NEG	NEG	NEG	NEG
Dichlorodifluoromethane (f)	EPA 601 (1)	ug/L	0.33		ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane (s)	EPA 601 (1)	ug/L	0.33		NEG	NEG	NEG	NEG	NEG	NEG
1,1-Dichloroethane (f)	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND
1,1-Dichloroethane (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG	NEG	NEG	NEG	NEG
1,2-Dichloroethane (f)	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND
1,2-Dichloroethane (s)	EPA 601 (1)	ug/L	0.44		NEG	NEG	NEG	NEG	NEG	NEG
1,1-Dichloroethene (f)	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG	NEG	NEG	NEG	NEG
trans-1,2-Dichloroethene (f)	EPA 601 (1)	ug/L	0.42		ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene (s)	EPA 601 (1)	ug/L	0.42		NEG	NEG	NEG	NEG	NEG	NEG
1,2-Dichloropropane (f)	EPA 601 (1)	ug/L	0.20		ND	ND	ND	ND	ND	ND
1,2-Dichloropropane (s)	EPA 601 (1)	ug/L	0.20		NEG	NEG	NEG	NEG	NEG	NEG
cis-1,3-Dichloropropene (f)	EPA 601 (1)	ug/L	0.58		ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene (s)	EPA 601 (1)	ug/L	0.58		NEG	NEG	NEG	NEG	NEG	NEG

"ND" indicates that the parameter was not detected.

URTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site	W-10 Site 1	GW 29 Site 2	W-2 Site 2	W-8 Site 2	W-7 Site 2	Trip Blank 02/15/86(3)
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)							
trans-1,3-Dichloropropene (f)	EPA 601 (1)	ug/L	0.39		ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene (s)	EPA 601 (1)	ug/L	0.39		NEG	NEG	NEG	NEG	NEG	NEG
Methylene Chloride (f)	EPA 601 (1)	ug/L	0.34		ND	ND	ND	ND	ND	ND
Methylene Chloride (s)	EPA 601 (1)	ug/L	0.34		NEG	NEG	NEG	NEG	NEG	NEG
1,1,2,2-Tetrachloroethane (f)	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG	NEG	NEG	NEG	NEG
Tetrachloroethene (f)	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND
Tetrachloroethene (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG	NEG	NEG	NEG	NEG
1,1,1-Trichloroethane (f)	EPA 601 (1)	ug/L	0.53		ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (s)	EPA 601 (1)	ug/L	0.53		NEG	NEG	NEG	NEG	NEG	NEG
1,1,2-Trichloroethane (f)	EPA 601 (1)	ug/L	0.51		ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane (s)	EPA 601 (1)	ug/L	0.51		NEG	NEG	NEG	NEG	NEG	NEG
Trichloroethene (f)	EPA 601 (1)	ug/L	0.60		ND	ND	ND	ND	ND	ND
Trichloroethene (s)	EPA 601 (1)	ug/L	0.60		NEG	NEG	NEG	NEG	NEG	NEG
Trichlorofluoromethane (f)	EPA 601 (1)	ug/L	0.44		5.0	1.2	5.4	5.6	5.4	ND
Trichlorofluoromethane (s)	EPA 601 (1)	ug/L	0.44		99%	99%	99%	99%	99%	NEG
Vinyl Chloride (f)	EPA 601 (1)	ug/L	0.54		ND	ND	ND	ND	ND	ND
Vinyl Chloride (s)	EPA 601 (1)	ug/L	0.54		NEG	NEG	NEG	NEG	NEG	NEG

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site	GW-52A Site 52	GW-52B Site 52	GW-52C Site 52	GW-52D Site 52	GW-52E Site 52	W-52E Site 52	W-7 Site 52	Trip Blank 09/16/86(3)
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)									
Bromodichloromethane (f)	EPA 601 (1)	ug/L	0.35		ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane (s)	EPA 601 (1)	ug/L	0.35		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Bromoform (f)	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND	ND	ND
Bromoform (s)	EPA 601 (1)	ug/L	0.45		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Bromoethane (f)	EPA 601 (1)	ug/L	0.63		ND	ND	ND	ND	ND	ND	ND	ND
Bromoethane (s)	EPA 601 (1)	ug/L	0.63		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Carbon Tetrachloride (f)	EPA 601 (1)	ug/L	0.46		ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride (s)	EPA 601 (1)	ug/L	0.46		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Chlorobenzene (f)	EPA 601 (1)	ug/L	0.37		ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene (s)	EPA 601 (1)	ug/L	0.37		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Chloroethane (f)	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
2-Chloroethylvinyl Ether (f)	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl Ether (s)	EPA 601 (1)	ug/L	0.44		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Chloroform (f)	EPA 601 (1)	ug/L	0.45		ND	ND	ND	ND	ND	ND	ND	ND
Chloroform (s)	EPA 601 (1)	ug/L	0.45		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Chloromethane (f)	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Dibromochloromethane (f)	EPA 601 (1)	ug/L	0.31		ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane (s)	EPA 601 (1)	ug/L	0.31		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

"ND" Indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Flatson AFB - Water Samples

Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	GW-52A Site 52	GW-52B Site 52	GW-52C Site 52	GW-52D Site 52	GW-52E Site 52	GT-52I Site 52	W-7 Site 52	Trip Blank 09/16/86(3
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)									
1,2-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.29		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.29		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,3-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.42		ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.42		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,4-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.41		ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.41		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Dichlorodifluoromethane (f)	EPA 601 (1)	ug/L	0.33		ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane (s)	EPA 601 (1)	ug/L	0.33		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,1-Dichloroethane (f)	EPA 601 (1)	ug/L	0.49		ND	ND	2.0	0.74	0.65	ND	ND	ND
1,1-Dichloroethane (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG	POS	POS	POS	NEG	NEG	NEG
1,2-Dichloroethane (f)	EPA 601 (1)	ug/L	0.44		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane (s)	EPA 601 (1)	ug/L	0.44		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,1-Dichloroethene (f)	EPA 601 (1)	ug/L	0.49		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
trans-1,2-Dichloroethene (f)	EPA 601 (1)	ug/L	0.42		ND	ND	2.4	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene (s)	EPA 601 (1)	ug/L	0.42		NEG	NEG	POS	NEG	NEG	NEG	NEG	NEG
1,2-Dichloropropane (f)	EPA 601 (1)	ug/L	0.20		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane (s)	EPA 601 (1)	ug/L	0.20		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
cis-1,3-Dichloropropene (f)	EPA 601 (1)	ug/L	0.58		ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene (s)	EPA 601 (1)	ug/L	0.58		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

"ND" Indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	GW-52A Site 52	GW-52B Site 52	GW-52C Site 52	GW-52D Site 52	GW-52E Site 52	W-52F Site 52	W-7 Site 52	Trip Blank 09/16/86(3
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)									
trans-1,3-Dichloropropene (f)	EPA 601 (1)	ug/L	0.39		ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene (s)	EPA 601 (1)	ug/L	0.39		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Methylene Chloride (f)	EPA 601 (1)	ug/L	0.34		ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride (s)	EPA 601 (1)	ug/L	0.34		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,1,2,2-Tetrachloroethane (f)	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Tetrachloroethene (f)	EPA 601 (1)	ug/L	0.38		ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,1,1-Trichloroethane (f)	EPA 601 (1)	ug/L	0.55		ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (s)	EPA 601 (1)	ug/L	0.55		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
1,1,2-Trichloroethane (f)	EPA 601 (1)	ug/L	0.51		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane (s)	EPA 601 (1)	ug/L	0.51		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Trichloroethene (f)	EPA 601 (1)	ug/L	0.60		ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (s)	EPA 601 (1)	ug/L	0.60		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Trichlorofluoromethane (f)	EPA 601 (1)	ug/L	0.44		21.	2.3	9.0	6.1	4.6	11.	8.7	ND
Trichlorofluoromethane (s)	EPA 601 (1)	ug/L	0.44		POS	POS	POS	POS	POS	POS	POS	NEG
Vinyl Chloride (f)	EPA 601 (1)	ug/L	0.54		ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride (s)	EPA 601 (1)	ug/L	0.54		NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Water Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	Trip Blank 09/17/86(2)	Field QC Site 32
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)			
Bromodichloromethane (f)	EPA 601 (1)	ug/L	0.35		ND	ND
Bromodichloromethane (s)	EPA 601 (1)	ug/L	0.35		NEG	NEG
Bromoform (f)	EPA 601 (1)	ug/L	0.45		ND	ND
Bromoform (s)	EPA 601 (1)	ug/L	0.45		NEG	NEG
Bromoethane (f)	EPA 601 (1)	ug/L	0.63		ND	ND
Bromoethane (s)	EPA 601 (1)	ug/L	0.63		NEG	NEG
Carbon Tetrachloride (f)	EPA 601 (1)	ug/L	0.46		ND	ND
Carbon Tetrachloride (s)	EPA 601 (1)	ug/L	0.46		NEG	NEG
Chlorobenzene (f)	EPA 601 (1)	ug/L	0.37		ND	ND
Chlorobenzene (s)	EPA 601 (1)	ug/L	0.37		NEG	NEG
Chloroethane (f)	EPA 601 (1)	ug/L	0.38		ND	ND
Chloroethane (s)	EPA 601 (1)	ug/L	0.38		NEG	NEG
2-Chloroethylvinyl Ether (f)	EPA 601 (1)	ug/L	0.44		ND	ND
2-Chloroethylvinyl Ether (s)	EPA 601 (1)	ug/L	0.44		NEG	NEG
Chloroform (f)	EPA 601 (1)	ug/L	0.45		ND	ND
Chloroform (s)	EPA 601 (1)	ug/L	0.45		NEG	NEG
Chloromethane (f)	EPA 601 (1)	ug/L	0.49		ND	ND
Chloromethane (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG
Dibromochloromethane (f)	EPA 601 (1)	ug/L	0.31		ND	ND
Dibromochloromethane (s)	EPA 601 (1)	ug/L	0.31		NEG	NEG

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	Trip Blank 09/17/86(3)	Field QC Site 32
Purgeable Halocarbons	EPA 601 (1)	ug/L	MDL (2)			
1,2-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.29		ND	ND
1,2-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.29		NEG	NEG
1,3-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.42		ND	ND
1,3-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.42		NEG	NEG
1,4-Dichlorobenzene (f)	EPA 601 (1)	ug/L	0.41		ND	ND
1,4-Dichlorobenzene (s)	EPA 601 (1)	ug/L	0.41		NEG	NEG
Dichlorodifluoromethane (f)	EPA 601 (1)	ug/L	0.33		ND	ND
Dichlorodifluoromethane (s)	EPA 601 (1)	ug/L	0.33		NEG	NEG
1,1-Dichloroethane (f)	EPA 601 (1)	ug/L	0.49		ND	1.8
1,1-Dichloroethane (s)	EPA 601 (1)	ug/L	0.49		NEG	POS
1,2-Dichloroethane (f)	EPA 601 (1)	ug/L	0.44		ND	ND
1,2-Dichloroethane (s)	EPA 601 (1)	ug/L	0.44		NEG	NEG
1,1-Dichloroethene (f)	EPA 601 (1)	ug/L	0.49		ND	ND
1,1-Dichloroethene (s)	EPA 601 (1)	ug/L	0.49		NEG	NEG
trans-1,2-Dichloroethene (f)	EPA 601 (1)	ug/L	0.42		ND	2.5
trans-1,2-Dichloroethene (s)	EPA 601 (1)	ug/L	0.42		NEG	POS
1,2-Dichloropropane (f)	EPA 601 (1)	ug/L	0.20		ND	ND
1,2-Dichloropropane (s)	EPA 601 (1)	ug/L	0.20		NEG	NEG
cis-1,3-Dichloropropene (f)	EPA 601 (1)	ug/L	0.58		ND	ND
cis-1,3-Dichloropropene (s)	EPA 601 (1)	ug/L	0.58		NEG	NEG

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT

Eielson AFB - Water Samples

Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field # Site	Trip Blank 09/17/86(3)	Field QC Site 32
Purgeable Halocarbons	EPA 601 (1)	ug/l	MDL (2)			
trans-1,3-Dichloropropene (f)	EPA 601 (1)	ug/l	0.39		ND	ND
trans-1,3-Dichloropropene (s)	EPA 601 (1)	ug/l	0.39		NEG	NEG
Methylene Chloride (f)	EPA 601 (1)	ug/l	0.34		ND	ND
Methylene Chloride (s)	EPA 601 (1)	ug/l	0.34		NEG	NEG
1,1,2,2-Tetrachloroethane (f)	EPA 601 (1)	ug/l	0.38		ND	ND
1,1,2,2-Tetrachloroethane (s)	EPA 601 (1)	ug/l	0.38		NEG	NEG
Tetrachloroethene (f)	EPA 601 (1)	ug/l	0.38		ND	ND
Tetrachloroethene (s)	EPA 601 (1)	ug/l	0.38		NEG	NEG
1,1,1-Trichloroethane (f)	EPA 601 (1)	ug/l	0.55		ND	ND
1,1,1-Trichloroethane (s)	EPA 601 (1)	ug/l	0.55		NEG	NEG
1,1,2-Trichloroethane (f)	EPA 601 (1)	ug/l	0.51		ND	ND
1,1,2-Trichloroethane (s)	EPA 601 (1)	ug/l	0.51		NEG	NEG
Trichloroethene (f)	EPA 601 (1)	ug/l	0.60		ND	ND
Trichloroethene (s)	EPA 601 (1)	ug/l	0.60		NEG	NEG
Trichlorofluoromethane (f)	EPA 601 (1)	ug/l	0.44		ND	4.4
Trichlorofluoromethane (s)	EPA 601 (1)	ug/l	0.44		NEG	POS
Vinyl Chloride (f)	EPA 601 (1)	ug/l	0.54		ND	ND
Vinyl Chloride (s)	EPA 601 (1)	ug/l	0.54		NEG	NEG

"ND" indicates that the parameter was not detected.

DATACHEM ANALYTICAL REPORT
Eielson AFB - Water Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 * One	Trip Blank * One (W-10)
Pesticides	EPA 608 (1)	ug/L	MDL (2)			
4,4'-DDT (f)	EPA 608 (1)	ug/L	0.005		ND	ND
4,4'-DDT (s)	EPA 608 (1)	ug/L	0.005		NEG	NEG
Dieldrin (f)	EPA 608 (1)	ug/L	0.003		ND	ND
Dieldrin (s)	EPA 608 (1)	ug/L	0.003		NEG	NEG
Endosulfan I (f)	EPA 608 (1)	ug/L	0.008		ND	ND
Endosulfan I (s)	EPA 608 (1)	ug/L	0.008		NEG	NEG
Endosulfan II (f)	EPA 608 (1)	ug/L	0.004		ND	ND
Endosulfan II (s)	EPA 608 (1)	ug/L	0.004		NEG	NEG
Endosulfan Sulfate (f)	EPA 608 (1)	ug/L	0.018		ND	ND
Endosulfan Sulfate (s)	EPA 608 (1)	ug/L	0.018		NEG	NEG
Endrin (f)	EPA 608 (1)	ug/L	0.002		ND	ND
Endrin (s)	EPA 608 (1)	ug/L	0.002		NEG	NEG
Endrin Aldehyde (f)	EPA 608 (1)	ug/L	0.021		ND	ND
Endrin Aldehyde (s)	EPA 608 (1)	ug/L	0.021		NEG	NEG
Heptachlor (f)	EPA 608 (1)	ug/L	0.01		ND	ND
Heptachlor (s)	EPA 608 (1)	ug/L	0.01		NEG	NEG
Aldrin (f)	EPA 608 (1)	ug/L	0.005		ND	ND
Aldrin (s)	EPA 608 (1)	ug/L	0.005		NEG	NEG
alpha-BHC (f)	EPA 608 (1)	ug/L	0.0004		ND	ND
alpha-BHC (s)	EPA 608 (1)	ug/L	0.0004		NEG	NEG

"ND" indicates that the parameter was not detected.
* Indicates monitor well resampled July, 1987.

DATACHEM ANALYTICAL REPORT
Eielson AFB - Water Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit	Field #: Site :	W-10 * One	Trip Blank * One (W-10)
Pesticides (continued)	EPA 608 (1)	ug/L	MDL (2)			
beta-BHC (f)	EPA 608 (1)	ug/L	0.001		ND	ND
beta-BHC (s)	EPA 608 (1)	ug/L	0.001		NEG	NEG
delta-BHC (f)	EPA 608 (1)	ug/L	0.002		ND	ND
delta-BHC (s)	EPA 608 (1)	ug/L	0.002		NEG	NEG
Lindane (f)	EPA 608 (1)	ug/L	0.004		ND	ND
Lindane (s)	EPA 608 (1)	ug/L	0.004		NEG	NEG
Chlordane (f)	EPA 608 (1)	ug/L	0.01		ND	ND
Chlordane (s)	EPA 608 (1)	ug/L	0.01		NEG	NEG
4,4'-DDD (f)	EPA 608 (1)	ug/L	0.001		ND	ND
4,4'-DDD (s)	EPA 608 (1)	ug/L	0.001		NEG	NEG
4,4'-DDE (f)	EPA 608 (1)	ug/L	0.001		ND	ND
4,4'-DDE (s)	EPA 608 (1)	ug/L	0.001		NEG	NEG
Heptachlor Epoxide (f)	EPA 608 (1)	ug/L	0.003		ND	ND
Heptachlor Epoxide (s)	EPA 608 (1)	ug/L	0.003		NEG	NEG
Toxaphene (f)	EPA 608 (1)	ug/L	0.01		ND	ND
Toxaphene (s)	EPA 608 (1)	ug/L	0.01		NEG	NEG

END NOTES

(1) "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods," SW-846, Second Edition, USEPA, 1984.

(2) Determined according to the procedure in Federal Register, Friday, 26 October, 1984, Part VIII.

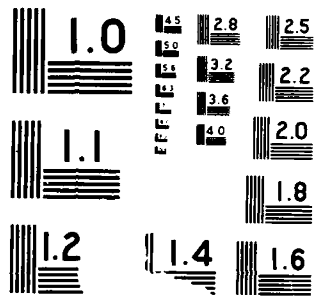
(3) "Methods for Chemical Analysis of Water and Wastes," EPA Manual 600/4-79-020, USEPA, March 1983.

"ND" indicates that the parameter was not detected.
* Indicates monitor well resampled July, 1987.

AD-A193 106 INSTALLATION RESTORATION PROGRAM PHASE 2 CONFIRMATION/QUANTIFICATION STAGE 2(U) DAMES AND MOORE PARK RIDGE IL 03 APR 88 F33615-83-D-4002

3/4

UNCLASSIFIED F/G 24/4 NL


1.0
1.1
1.2
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit (2)	B1A0-1.5 Site 1	B1A2.5-4 Site 1	B1A5-6.5 Site 1	B1A7.5-9 Site 1	B1B0-1.5 Site 1	B1B2.5-4 Site 1	B1B2.5-4 Site 1	B1B5-6.5 Site 1	B1B7.5-9 Site 1
Aldrin (f)	EPA SW3550/8080(1)	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin (s)	EPA SW3550/8080(1)	mg/kg	0.005	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
alpha-BHC (f)	EPA SW3550/8080(1)	mg/kg	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC (s)	EPA SW3550/8080(1)	mg/kg	0.0004	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
beta-BHC (f)	EPA SW3550/8080(1)	mg/kg	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC (s)	EPA SW3550/8080(1)	mg/kg	0.0001	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
delta-BHC (f)	EPA SW3550/8080(1)	mg/kg	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC (s)	EPA SW3550/8080(1)	mg/kg	0.0002	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Lindane (f)	EPA SW3550/8080(1)	mg/kg	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lindane (s)	EPA SW3550/8080(1)	mg/kg	0.0004	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Chlordane (f)	EPA SW3550/8080(1)	mg/kg	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane (s)	EPA SW3550/8080(1)	mg/kg	0.001	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
4,4'-DDD (f)	EPA SW3550/8080(1)	mg/kg	0.0002	0.002	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD (s)	EPA SW3550/8080(1)	mg/kg	0.0002	POS	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
4,4'-DDE (f)	EPA SW3550/8080(1)	mg/kg	0.0005	0.004	ND	ND	ND	0.003	0.001	ND	0.002	ND
4,4'-DDE (s)	EPA SW3550/8080(1)	mg/kg	0.0005	POS	NEG	NEG	NEG	POS	POS	NEG	POS	NEG
4,4'-DDT (f)	EPA SW3550/8080(1)	mg/kg	0.0005	0.007	ND	ND	ND	0.005	0.001	0.005	0.02	0.003
4,4'-DDT (s)	EPA SW3550/8080(1)	mg/kg	0.0005	POS	NEG	NEG	NEG	POS	POS	POS	POS	POS
Dieldrin (f)	EPA SW3550/8080(1)	mg/kg	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin (s)	EPA SW3550/8080(1)	mg/kg	0.0003	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

"ND" indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit (2)	B1A0-1.5 Site 1	B1A2.5-4 Site 1	B1A5-6.5 Site 1	B1A7.5-9 Site 1	B1B0-1.5 Site 1	B1B2.5-4 Site 1	B1B2.5-4 Site 1	B1B5-6.5 Site 1	B1B7.5-9 Site 1
Endosulfan I (f)	EPA SW3550/8080(1)	mg/kg	0.0008	ND	.003	.002	ND	.001	.003	.009	.002	ND
Endosulfan I (s)	EPA SW3550/8080(1)	mg/kg	0.0008	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endosulfan II (f)	EPA SW3550/8080(1)	mg/kg	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II (s)	EPA SW3550/8080(1)	mg/kg	0.0004	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endosulfan Sulfate (f)	EPA SW3550/8080(1)	mg/kg	0.0018	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate (s)	EPA SW3550/8080(1)	mg/kg	0.0018	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endrin (f)	EPA SW3550/8080(1)	mg/kg	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin (s)	EPA SW3550/8080(1)	mg/kg	0.0002	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endrin Aldehyde (f)	EPA SW3550/8080(1)	mg/kg	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde (s)	EPA SW3550/8080(1)	mg/kg	0.0021	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Heptachlor (f)	EPA SW3550/8080(1)	mg/kg	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor (s)	EPA SW3550/8080(1)	mg/kg	0.001	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Heptachlor Epoxide (f)	EPA SW3550/8080(1)	mg/kg	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide (s)	EPA SW3550/8080(1)	mg/kg	0.0003	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Toxaphene (f)	EPA SW3550/8080(1)	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene (s)	EPA SW3550/8080(1)	mg/kg	0.01	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

"ND" Indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit (2)	B1B7.5-9 Site 1	B1C0-1.5 Site 1	B1C2.5-4 Site 1	B1C5-6.5 Site 1	B1C7.5-9 Site 1	B1D0-1.5 Site 1	B1D2.5-4 Site 1	B1D5-6.5 Site 1	B1D7.5-9 Site 1
Aldrin (f)	EPA SW3550/8080(1)	mg/kg	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin (s)	EPA SW3550/8080(1)	mg/kg	0.005	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
alpha-BHC (f)	EPA SW3550/8080(1)	mg/kg	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC (s)	EPA SW3550/8080(1)	mg/kg	0.0004	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
beta-BHC (f)	EPA SW3550/8080(1)	mg/kg	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC (s)	EPA SW3550/8080(1)	mg/kg	0.0001	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
delta-BHC (f)	EPA SW3550/8080(1)	mg/kg	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC (s)	EPA SW3550/8080(1)	mg/kg	0.0002	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Lindane (f)	EPA SW3550/8080(1)	mg/kg	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lindane (s)	EPA SW3550/8080(1)	mg/kg	0.0004	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Chlordane (f)	EPA SW3550/8080(1)	mg/kg	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane (s)	EPA SW3550/8080(1)	mg/kg	0.001	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
4,4'-DDD (f)	EPA SW3550/8080(1)	mg/kg	0.0002	ND	0.003	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD (s)	EPA SW3550/8080(1)	mg/kg	0.0002	NEG	POS	NEG	NEG	NEG	NEG	NEG	NEG	NEG
4,4'-DDE (f)	EPA SW3550/8080(1)	mg/kg	0.0005	0.001	0.001	ND	ND	0.001	ND	ND	ND	ND
4,4'-DDE (s)	EPA SW3550/8080(1)	mg/kg	0.0005	POS	POS	NEG	NEG	POS	NEG	NEG	NEG	NEG
4,4'-DDT (f)	EPA SW3550/8080(1)	mg/kg	0.0005	0.002	0.002	ND	0.001	0.004	0.003	0.001	ND	ND
4,4'-DDT (s)	EPA SW3550/8080(1)	mg/kg	0.0005	POS	POS	NEG	POS	POS	POS	POS	NEG	NEG
Dieldrin (f)	EPA SW3550/8080(1)	mg/kg	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin (s)	EPA SW3550/8080(1)	mg/kg	0.0003	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

"ND" Indicates that the parameter was not detected.

UBTL ANALYTICAL REPORT
Eielson AFB - Soil Samples
Second Column Confirmation

Parameter	Method	Units	Detection Limit (2)	B187.5-9 Site 1	B100-1.5 Site 1	B102.5-4 Site 1	B105-6.5 Site 1	B107.5-9 Site 1	B100-1.5 Site 1	B102.5-4 Site 1	B105-6.5 Site 1	B107.5-9 Site 1
Endosulfan I (f)	EPA SW3550/8080(1)	mg/kg	0.0008	.001	.003	ND	.003	ND	.003	.002	.003	ND
Endosulfan I (s)	EPA SW3550/8080(1)	mg/kg	0.0008	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endosulfan II (f)	EPA SW3550/8080(1)	mg/kg	0.0004	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan II (s)	EPA SW3550/8080(1)	mg/kg	0.0004	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endosulfan Sulfate (f)	EPA SW3550/8080(1)	mg/kg	0.0018	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan Sulfate (s)	EPA SW3550/8080(1)	mg/kg	0.0018	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endrin (f)	EPA SW3550/8080(1)	mg/kg	0.0002	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin (s)	EPA SW3550/8080(1)	mg/kg	0.0002	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Endrin Aldehyde (f)	EPA SW3550/8080(1)	mg/kg	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde (s)	EPA SW3550/8080(1)	mg/kg	0.0021	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Heptachlor (f)	EPA SW3550/8080(1)	mg/kg	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor (s)	EPA SW3550/8080(1)	mg/kg	0.001	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Heptachlor Epoxide (f)	EPA SW3550/8080(1)	mg/kg	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor Epoxide (s)	EPA SW3550/8080(1)	mg/kg	0.0003	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG
Toxaphene (f)	EPA SW3550/8080(1)	mg/kg	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene (s)	EPA SW3550/8080(1)	mg/kg	0.01	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG	NEG

(1) EPA SW-846, Second Edition, July 1982.
(2) Determined according to the procedure in Federal Register, Friday, October 26, 1984, Part VIII.

"ND" indicates that the parameter was not detected.

APPENDIX I

CORRESPONDENCE WITH REGULATORY AGENCIES

Dames & Moore

1550 Northwest Highway
Park Ridge, Illinois 60068
(312) 297-6120

March 9, 1987

EPA Region X Laboratory
P.O. Box 549
Manchester, WA 98353

Attention: Mr. Robert Rieck

Re: Sample Handling Procedures
USEPA Methods SW 3550/8080

Gentlemen:

Dames & Moore is under contract to the United States Air Force to provide site assessment information for the Installation Restoration Program (IRP). The IRP is a nationwide effort intended to identify, evaluate the extent of, and mitigate environmental contamination potentially induced by the mobilization and migration of hazardous or toxic chemicals from past disposal or other handling practices at USAF facilities.

As part of the IRP, Dames & Moore was retained to obtain soil samples from an Air Force base in central Alaska for the purpose of ascertaining possible pesticide contamination. Soil samples were obtained by a standard split spoon; the borings were advanced by means of a hollow stem auger. Decontamination procedures of the drilling rig, augers and split spoon were approved by the USAF.

The soil samples were placed in laboratory cleaned glass jars with Teflon[R] lined lids. The soils were placed on ice while in the field and, at the end of the sampling day, were placed in frozen storage.

The samples were collected on August 12 and 13, 1986. The soils were removed from frozen storage and extracted by U.S. EPA Method 3550 on September 4 and 5, 1986, twenty-three to twenty-four days after sampling. Finally, the samples were analyzed by U.S. EPA Method 8080 on September 12, 1986, seven to eight days after extraction.

For several reasons, but particularly due to the logistics of collecting and transporting a large number of soil samples daily from a remote site in Alaska to an airport located several hours away, it was decided to freeze the samples. As a result, the samples exceeded the prescribed holding times. However, since the samples were frozen on the day that they were collected and subsequently extracted and analyzed within the prescribed times, it is Dames & Moore's opinion that the analytical results are valid and should be acceptable for their intended objective--to confirm the presence of pesticides in the soil.

Dames & Moore

If you agree with us regarding the validity of this data, we would appreciate a short letter of concurrence.

Should you have any questions, please do not hesitate to call me.

Very truly yours,

DAMES & MOORE

Michael W. Ander

Michael W. Ander
Associate

Carol J. Scholl

Carol J. Scholl
Geologist

MWA/CJS:gf

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
P.O. BOX 549
MANCHESTER, WASHINGTON 98353
FTS - 399-0370

April 21, 1987

REPLY TO
ATTN OF: EPA Region 10 Laboratory

Ms. Carol J. Scholl
Dames & Moore
1550 Northwest Highway
Park Ridge, Ilinois 60068

Dear Ms. Scholl:

This letter is pursuant to to your request dated March 9, 1987 regarding sample handling procedures for soils collected for USAF facilities in Alaska.

According to the draft document, "Recommended Protocols for Measuring Organic Compounds in Puget Sound Sediment and Tissue Samples," samples should be stored in the dark at 4°C, on ice or frozen. Freezing is preferred for samples used for extractable organic compound analyses if the analysis will not be performed within the recommended 7-day holding time. We hold to this in our region especially for pesticides.

Acording to your described protocol-placing the samples on ice, freezing the samples at the end of the sampling day, and analyzing the sample extracts within seven or eight days - it is my opinion that no degradation of the pesticides took place and the results should be valid to confirm the presence of pesticides in soil.

If any additional information is needed, I can be reached at 206-442-0370.

Sincerely,
R. H. Rieck
Robert H. Rieck
Regional Certification Authority-Chemistry

cc: M. Johnston

APPENDIX J

REFERENCES

REFERENCES

ADEC, 1983, Wells A and B Water Samples. Personal communication from Stan Justice, Environmental Engineer, to Carol D. Hughes, Col., Base Commander, 343 CSG; Eielson AFB, Alaska (June 30).

American Public Health Association, 1985, Standard Methods for the Examination of Water and Wastewater, 16th edition. Washington, D.C.

American Society for Testing and Materials (ASTM), 1976, Annual Book of ASTM Standards, Laboratory Determination of Moisture Content in Soil, D-2216-71. Philadelphia, Pennsylvania.

_____, 1980, Annual Book of Standards, Part 31, Water. Philadelphia, Pennsylvania.

CH2M Hill, 1982, Installation Restoration Program Records Search for Eielson Air Force Base, Alaska (November).

Dames & Moore, 1986, Installation Restoration Program, Phase II - Confirmation/ Quantification, Stage 1, for Eielson Air Force Base, Alaska (March).

Federal Register, 1984, Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. Vol. 49, No. 209 (Friday, October 26).

JRB Associates, Inc., 1980, Methodology for Rating the Hazard Potential of Waste Disposal Sites. McLean, Virginia.

Péwé, T.L., Wahrhaftig, C., and Weber, F., 1966, Geologic Map of the Fairbanks Quadrangle, Alaska. USGS, Map I-455, scale 1:250,000.

Resource Conservation and Recovery Act of 1976. 42 USCA §6901 et seq.

Safe Drinking Water Act. 42 USCA §300f et seq.

U.S. Air Force, 1983, Drinking Water Treatment Not Meeting State Standards. Personal communication from John M. Clegg, Jr., Capt., USAF, BSC, Chief, Bioenvironmental Engineering, SGPB, Eielson AFB, Alaska, to 343 COMPW/CC, 343 CSG/CC, and 343 CSG/DE (April 25).

U.S. Environmental Protection Agency, 1979, Methods for Chemical Analysis of Water and Wastes. Manual EPA-600/4-79-020, Environmental Monitoring and Support Laboratory, Office of Research and Development, Cincinnati, Ohio.

_____, 1982, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Second Edition.

TABLE J-1

PARAMETERS, LIMITS OF DETECTION FOR SOIL AND GROUND WATER ANALYSES, AND WATER QUALITY CRITERIA

PARAMETER	LIMIT OF DETECTION, SOIL (μg/g)	LIMIT OF DETECTION, WATER (μg/L)	PRIMARY DRINKING WATER STANDARD (μg/L)
TOC	--	1000	NE
TOX	--	10	NE
TDS	--	1000	NE
Lead	6	10	50
Phenol	5	10	NE
PCBs	0.05	0.5	NE
Oil and Grease	8.0	500	NE
Aldrin	0.002	--	NE
Dieldrin	0.002	--	NE
Chlordane	0.02	--	NE
Endrin	0.002	--	0.2
Endrin Aldehyde	0.002	--	NE
Heptachlor	0.002	--	NE
Lindane	0.002	--	4.0
o,p-DDT	0.005	--	NE
p,p-'DDT	0.005	--	NE
DDE	0.002	--	NE
DDD	0.002	--	NE

Note: NE = no criterion established
μg/L = micrograms per liter
μg/g = micrograms per gram

Source: Dames & Moore, 1986.

TABLE J-2

UBTL ANALYTICAL REPORT
EIELSON AFB - WATER ANALYSES

PARAMETER	METHOD	UNITS	DETECTION LIMIT	FSA	SITE 3	FUEL SATURATED AREA				SITE 32	SITE 2		SITE 1
				W-1	W-2	W-3	W-4	W-5	W-6	W-7	W-8	W-9	W-10
TOC	415.1[a]	mg/L	1.	6.	4.	5.	4.	3.	4.	11.	6.	6.	1.
TOX	9020[b]	µg/L	10.	110.	90.	110.	110.	97.	96.	180.	100.	110.	89.
TDS	160.1[a]	mg/L	1.	--	283.	--	--	--	--	--	--	168.	--
Lead	239.2[a]	mg/L	0.01	0.02	0.04	d	0.04	d	0.02	d	0.06	0.03	0.02
Phenols	420.2[a]	µg/L	10.	--	d	--	--	--	--	d	d	d	d
PCBs	608[c]	µg/L	0.5	--	d	--	--	--	--	d	d	d	d
Oil and Grease	413.2[a]	mg/L	0.5	11.2	2.3	2.8	2.3	1.7	2.2	3.1	1.2	1.8	2.0
pH (field)	--	--	--	7.25	7.45	6.8	7.2	7.0	6.95	7.05	7.05	7.15	6.85
Specific Conductance @ 25°C		µmhos/cm	--	237.	442.	223.	305.	259.	260.	519.	236.	195.	211.

FSA = Fuel Saturated Area.

-- indicates not analyzed.

[a]Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.

[b]Test Methods for Evaluating Solid Waste, SW-846, second edition, July 1982, modified for use on an O.I. Corp. Model 610 TOX analyzer.

[c]*Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, EPA-600/4-82-057, July 1982.

[d]Less than detection limit.

Source: Dames & Moore, 1986.

TABLE J-3

UBTL ANALYTICAL REPORT
EIELSON AFB - SOIL ANALYSES[a]

PARAMETER	METHOD	UNITS	DETECTION LIMIT	FSA W-1-2 5.0'	FSA W-1-3 10.0'	SITE 3 W-2-2 5.0'	SITE 3 W-2-3 10.0'	FSA W-3-2 5.0'	FSA W-3-3 10.0'	FSA W-4-3 10.0'	FSA W-4-4 15.0'	FSA W-5-2 5.0'
PCBs	8080[b]	μg/g	0.05	--	--	d	<1.0	--	--	--	--	--
Oil and Grease	413.2[c]	mg/g	0.008	0.53	0.050	0.097	0.033	0.017	0.017	0.014	d	d
Percent Moisture	--	%	--	2.4	10.	20.	19.	18.	19.	9.7	12.	19.

PARAMETER	METHOD	UNITS	DETECTION LIMIT	FSA W-5-3 10.0'	FSA W-6-3 10.0'	FSA W-6-4 15.0'	SITE 32 W-7-3 10.0'	SITE 32 W-7-4 15.0'	SITE 2 W-8-2 5.0'	SITE 2 W-8-3 10.0'	SITE 2 W-9-2 5.0'	SITE 2 W-9-3 10.0'
PCBs	8080[b]	μg/g	0.05	--	--	--	d	d	d	d	d	d
Oil and Grease	413.2[c]	mg/g	0.008	0.013	d	d	0.01	d	0.014	d	0.016	d
Percent Moisture	--	%	--	18.	12.	17.	7.1	13.	15.	14.	17.	21.

FSA = Fuel Saturated Area.

-- indicates not analyzed.

[a]Results are corrected for percent moisture.

[b]Test Methods for Evaluating Solid Waste, SW-846, second edition, July 1982.

[c]Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.

[d]Less than detection limit.

Source: Dames & Moore, 1986.

TABLE J-3 (continued)

PARAMETER	METHOD	UNITS	DETECTION LIMIT	SITE 1 W-10-1 0.0'	W-10-2 5.0'	W-10-3 10.0'	W-10-4 15.0'	W-10-5 20.0'
PCBs	8080[b]	µg/g	0.05	--	--	d	d	--
Oil and Grease	413.2[c]	mg/g	0.008	--	--	0.009	d	--
Percent Moisture	--	%	--	3.1	3.2	12.	11.	14.
Aldrin	8080[b]	µg/g	0.002	d	d	d	d	d
Dieldrin	8080[b]	µg/g	0.002	d	d	d	d	d
Chlordane	8080[b]	µg/g	0.02	d	d	d	d	d
Endrin	8080[b]	µg/g	0.002	d	d	d	d	d
Endrin Aldehyde	8080[b]	µg/g	0.002	d	d	d	d	d
Heptachlor	8080[b]	µg/g	0.002	d	d	d	d	d
Lindane	8080[b]	µg/g	0.002	d	d	d	d	d
o,p-DDT	8080[b]	µg/g	0.005	0.009	0.006	d	d	d
p,p'-DDT	8080[b]	µg/g	0.005	0.057	0.030	d	d	d
DDD	8080[b]	µg/g	0.002	0.023	0.010	d	d	d
DDE	8080[b]	µg/g	0.002	d	d	d	d	d

APPENDIX K

BIOGRAPHIES OF KEY PERSONNEL

Curriculum Vitae

MICHAEL W. ANDER

Title	Senior Environmental Scientist/Associate
Expertise	Environmental Analysis/Impact Assessment Environmental Auditing
Experience With Firm	Conducts and manages hazardous waste contamination studies for industrial and government clients throughout the United States. Joined Dames & Moore in 1973.

Senior Environmental Scientist/Associate

- Environmental audits and risk assessments for several industrial facilities in the Midwest.
- Geohydrologic assessment of a chemically contaminated plant site in Michigan, including evaluation of containment and treatment measures.
- Geohydrologic assessment of a chemical waste disposal facility in Michigan.
- Environmental studies and development of remedial actions for over thirty PCB-contaminated industrial sites throughout the Midwest.
- Environmental analysis and impact assessment report for a 600-megawatt electric coal-fired power plant in Missouri.
- Assessment of the impact to benthic and fish communities generated by the increase of industrial effluent to a river in northern Illinois.
- Land reclamation study for a highly acidic, abandoned coal strip mine in north-central Illinois.
- Evaluation of the environmental enhancement resulting from the dredging of polluted sediments from the Little Calumet River in Illinois.
- Study of the economic and environmental implications of developing low-head hydroelectric power on the Fox River in Illinois.
- Environmental assessment of lead in the soils and ground water near a battery reprocessing plant in Illinois.
- Environmental assessment of selected river basins, tributary to the Illinois River, for a statewide stream survey for the Illinois Environmental Protection Agency. Project involved the analysis of nearly 2,000 benthic samples.

Assistant Project Manager

- Environmental baseline studies and impact assessment of copper/zinc mine in northern Wisconsin, including analysis and evaluation of fisheries, plankton, and periphitic algae with special emphasis on water chemistry and benthis macroinvertebrates.
- Preparation and coordination of final safety analysis report and an environmental report of a nuclear power plant in Missouri.

Principal Investigator/Aquatic Ecologist

- Environmental studies required for the preparation of permit applications and reclamation plans for several coal mines and a coal preparation plant in eastern Kentucky.
- Environmental assessment of dredging an estuary and salt marsh for a chemical plant in South Carolina. Project included an analysis and evaluation of fisheries, plankton, and water chemistry with special emphasis on the collection and analysis of benthic macroinvertebrates.

Project Quality Assurance Coordinator

- Management of numerous projects requiring quality assurance in compliance with Nuclear Regulatory Commission regulations.
- Implementation of Dames & Moore's quality assurance manual on all nuclear-related projects.

Past Experience	Four years experience in aviation electronics.
	Aviation Electronics Technican, U.S. Navy (1969-1973) • Maintenance of electronic systems of A-7 attact aircraft. • Counselor, Naval Drug Rehabilitation Center.
Academic Background	M.S. (1970), biological sciences, and B.S. (1967), biological sciences, Northern Illinois University
Citizenship	United States
Countries Worked In	United States
Langugage Proficiency	English
Professional Affiliations	North American Benthological Society; International Oceanographic Foundation; Illinois Association of Environmental Professionals; Ecological Society of America.
Registrations	Certified SCUBA Diver

† † †

Curriculum Vitae

BEVERLY J. HARPER

Title Project Ecologist

Expertise Environmental Analysis and Impact Assessment
Aquatic Ecology

Experience with Firm Conducts and manages environmental studies and impact assessments for industrial and government clients throughout the United States. Joined Dames & Moore in 1973 and rejoined the firm in 1985 after a 2-year absence.

Principal Investigator/Aquatic Ecologist

- o Evaluation of the environmental enhancement resulting from the dredging of polluted sediments from the Little Calumet River in Illinois.
- o Coordination of environmental baseline studies and impact assessment for a copper/zinc mine in northern Wisconsin.
- o Environmental assessment of potential chemical contamination in the Menominee River, Wisconsin.
- o Environmental site assessments of various sites throughout the country for purposes of acquisition.
- o Assessment of the impact to aquatic communities by the increase of industrial effluent to a river in northern Illinois.
- o Zooplankton specialist with experience in environmental studies in Florida, Maryland, South Carolina, Texas, and Wisconsin.
- o Supervision of the Environmental Laboratory, Park Ridge office. Implemented laboratory quality assurance program.
- o Supervision of the analysis of data from several environmental studies.
- o Team leader for various environmental field investigations.
- o Technical reviewer for biology sections for a nuclear power plant biological monitoring study.
- o Biological studies and environmental monitoring for various nuclear power plant projects construction and operating licensing.

Assistant Project Manager

- o Preparation and coordination of Final Safety Analysis and Environmental Reports for a nuclear power plant in Kansas and other nuclear plants nationwide.
- o Environmental baseline studies and impact assessment for a 600-megawatt electric coal-fired power plant in Missouri.
- o Hazardous waste field investigations, feasibility studies, and cleanup strategies for numerous U.S. Air Force facilities throughout the United States.

Dames & Moore

Academic Background	B.S., Biology, Northern Illinois University, 1971. Coursework completed towards M.S. with emphasis in Ecology, Northern Illinois University.
Citizenship	United States
Countries Worked In	United States
Language Proficiency	English
Professional Affiliations	North American Benthological Society International Oceanographic Foundation National Audubon Society

nl-ts

Curriculum Vitae

THOMAS E. JENSEN

Title
Senior Geologist/Geophysicist

Expertise
Engineering Geophysics
Applied Instrumentation
General Geology

Experience With Firm
Principal Investigator

- Seismic investigations to develop engineering properties using combinations of seismic refraction, uphole/downhole, crosshole, surface wave, and ambient motion studies; conducted for nuclear and fossil-fueled power plants, nuclear fuel storage reprocessing and research facilities, fault investigations, and correctional facilities.
- Reconnaissance and feasibility studies for depth of bedrock, bedrock topography, water table, and rippability using seismic refraction methods.
- Evaluation of soil improvement through geophysical testing.
- Geotechnical investigation for water bottom and subsurface conditions for a pipeline river crossing using high resolution reflection, side-scan sonar, and bottom probes.
- Vibration control and attenuation studies of production quarrying and excavation blasting operations; conducted for nuclear power plants, a nuclear fuel processing facility, a petroleum pipeline and sewer interceptor, and residential and commercial structures.
- Vibration monitoring of production and excavation blasting, pile driving, earthwork, and machinery operation.
- Recommendations and performance evaluation of controlled blasting operations for smoothwall excavations.
- Borehole geophysical logging.
- Electrical resistivity profiling and depth sounding.
- Rock mechanics studies for a longwall coal mining demonstration.
- Geologic and hydrogeologic studies for baseline data to prepare environmental impact assessment and permit applications.
- Structure evaluation by high resolution seismic reflection surveys, test drilling, borehole logging and uphole surveys for a field scale test site for aquifer storage and for compressed air energy storage.

Project Manager

- Preparation of soils, geology, hydrology, and sociocultural baseline reports for an environmental impact assessment.
- Rock mechanics studies for a longwall coal mining demonstration.

Technical Reviewer
- Provide technical review of seismic investigations for nuclear-related projects.
- Review of high resolution marine reflection and refraction surveys.
- Review of test blasting, blast monitoring, and attenuation studies.

Past Experience	Geophysicist, Texaco Incorporated, Houston, Texas and New Orleans, Louisiana • Involved in interpretation of offshore Gulf of Mexico seismic refraction data. • Participated in preparation of map packages for lease sales.
Academic Background	B.S. and M.S., geology, Northern Illinois University Seminar and workshops on engineering geophysics, Colorado School of Mines
Professional Affiliations	Society of Exploration Geophysicists
Registrations	Geophysicist, California

◆ ◆ ◆

Curriculum Vitae

AMY D. LAMBORG

Title	Assistant Geologist
Expertise	Geology, Geohydrology
Experience with Firm	o Supervised field investigations of several large hydrogeologic/hazardous waste projects for U.S. Air Force. Field efforts included monitor well installation and sampling, soil boring description and sampling, and surface water and surface soil sampling for bases in Fairbanks, Clear, and Anchorage, Alaska and Duluth, Minnesota. o Completed geohydrological field investigation at a hazardous waste landfill in Plymouth, Indiana, which included monitor well installation, soil sampling, and slug testing. o Performed site assessment at a plastics manufacturing plant in north-central Illinois. Program included collecting composite soil and water samples for analyses. o Logged test pits, collected soil and water samples, and installed monitor wells for railroad yards in Chicago, Illinois. o Sampled drums of hazardous waste at an industrial site in Elgin, Illinois.
Past Experience	Geologist, Amoco Production Company o Evaluated wells for recompletion potential, southeastern New Mexico. Geologist, Wayne Pryor and Associates o Constructed structure and isopach maps for Mississippian formations in south-central Illinois. Geological Technician, Gulf Oil Company o Constructed regional cross sections, structure and isopach maps from computer data base for offshore Gulf Coast.
Academic Background	M.S., Geology, University of Cincinnati, 1986. Thesis topic: "Development and Distribution of Primary and Secondary Porosity in the Salem Limestone, South-Central Illinois." B.A., Geology, Earlham College, 1980
Awards	Amoco Production Company Fellowship, 1983 University Graduate Scholarship, 1982 Teaching Assistantship, 1982 Weber Scholar - Athlete Award, 1980
Countries Worked in	United States Argentina
Language Proficiency	English Spanish
Professional Affiliations	American Association of Petroleum Geologists

na-ts **Dames & Moore**

Curriculum Vitae

ROBERT E. QUINLAN

Title Staff Biologist

Expertise Aquatic Biology

Experience With Firm

- Co-Principal Investigator assessing aquatic concerns for a coal-to-methanol facility feasibility study in Dunn County, North Dakota including off-site product pipeline route environmental assessment.
- Co-Principal Investigator evaluating impacts to fishery resources for an environmental impact statement regarding water supply systems for a lignite mine and sythetics plant in east Texas.
- Evaluation of impacts to fishery resources for an environmental impact statement regarding expansion of sewage treatment facilities in Missoula, Montana.
- Evaluation of impacts to aquatic resources in Clear Creek in the Denver metropolitan area for an assessment of impacts due to sewage treatment facilities expansion in Golden, Colorado.
- Aquatic species evaluation and analysis of potential impacts for alternative coal-fired generating facility sites established by the Los Angeles Department of Water and Power in White Pine County, Nevada.
- Principal Investigator assessing aquatic and hydrologic concerns for dredge and fill permitting in Polk County, Florida.
- Performed "Instream Flow Incremental Analysis" on streams in northwest Alaska to formulate a predictive model for the assessment of possible mining related impacts-induced changes in stream flow regimes on Arctic grayling and Arctic char populations.

Past Experience

Assistant Fisheries Biologist, Wyoming Game and Fish Department, Pinedale, Wyoming.

- Evaluated fish habitat quality and fisheries exploitation on the Upper Green River.

Assistant Fisheries Biologist, Wyoming Game and Fish Department, Laramie, Wyoming.

- Evaluated brown and rainbow trout populations in the Upper North Platte River.

Research Assistant, University of Wyoming, Laramie, Wyoming.

- Researched the reproductive biology of the Colorado River cutthroat trout *(Salmo clarki pleuriticus)* in the Sierra Madre Mountains of southcentral Wyoming.
- Research included evaluating age-growth, population (inter-action, fecundity, egg mortality, and physical and chemical parameters) associated with this State-listed sensitive species.

Academic Background

A.S., biology, Casper College, Casper, Wyoming.
B.S., zoology, fisheries management, University of Wyoming, Laramie, Wyoming.
M.S., zoology, aquatic biology, University of Wyoming, Laramie, Wyoming.

Professional Background American Fisheries Society, Colorado-Wyoming Chapter of the American Fisheries Society.

Publications Thesis: A study of the Biology of the Colorado River Cutthroat Trout *(Salmo clarki pleuriticus)* Population in the North Fork of the Little Snake River Drainage in Wyoming.

* * *

Curriculum Vitae

Carol Jean Scholl

Title Project Geologist

Expertise Geology
Ground-Water Hydrology

Experience With Firm Provides consultation on geologic and ground-water aspects of the firm's hazardous waste, nuclear and mining projects. Joined Dames & Moore in 1973 and rejoined the firm in 1983.

Project Geologist

- Performed cost-effectiveness analyses of alternate disposal methods for hazardous waste contaminated soils.
- Designed and managed hazardous waste field investigations at U.S. Air Force installations in seven states. The program involved the analysis and evaluation of hazardous materials in soil and ground water including fuels, solvents and trace metals.
- Managed field investigations to assess the environmental impacts of the uncontrolled disposal of heavy metals and industrial wastes in till plain soils.

Staff Geologist

- Planned and managed a hydrogeologic investigation of a waste management facility for a petrochemical firm.
- Performed environmental assessments on the impacts of landfills to the environment.
- Designed and managed a field investigation involving the impact of a chemical process facility on ground water and surface water quality.
- Prepared personnel safety plans for investigations at hazardous waste sites.
- Served as Dames & Moore's group contact coordinator for the Electric Power Research Institute's Seismic Risk Hazard Analysis Program performed in the eastern United States.
- Prepared responses to questions posed by the Nuclear Regulatory Commission concerning faulting studies for a nuclear power plant in southern Indiana.

Assistant Geologist

- Assisted in the compilation and reduction of ground-water data for preliminary safety analysis reports for three potential nuclear power plant sites in Kansas, Missouri and

Illinois.

- Participated in detailed field structural geological studies of a potential nuclear power plant site in Pennsylvania.
- Performed engineering geological duties for a rock coring and soil sampling program at a nuclear power plant site in northwestern Illinois.
- Assisted in the reduction of ground-water data for a hydrologic study of a proposed coal strip mine in eastern Montana.

Past Experience

A total of ten years experience in geology education and research.

Head of Group Programs/Instructor of Geology, Field Museum of Natural History, Chicago

- Supervised professional and clerical staff members of a division of the Department of Education.
- Participated in planning and decisions regarding departmental policies, budgets and procedures.
- Instructed school groups, adult volunteers and other adult groups in geology.
- Trained adult volunteers to present geology tours.
- Supervised a manned exhibit featuring a hands-on environment of natural history specimens.

Graduate Teaching Fellow and Associate/Graduate Teaching Assistant, Miami University, Oxford, Ohio

- Studies course work toward Ph.D., with emphasis on geochemistry and mineralogy.

Academic Background

M.S. (1970), geology, Miami University, Oxford, Ohio
B.S. (1966), geology, Kent State University, Ohio

Citizenship

United States

Countries Worked In

United States

Language Proficiency

English

Professional Affiliations

American Association for the Advancement of Science; Mineralogical Society of America; National Water Well Association.

Curriculum Vitae

JON MICHAEL STANLEY

Title	Senior Engineering Geologist
Expertise	Engineering Geology Geotechnical Engineering Project Management

Experience with Firm

- o Engineering aspects of transportation corridors, port sites, and mining facilities and dams for a lead/zinc mine in northwestern Alaska. Regional engineering geology, quantification of potential engineering problems along alternative routes and offshore geotechnical engineering for a port site.
- o Engineering geology, foundation design, and wastewater treatment and disposal systems design for a U.S. Navy building on Adak, Alaska.
- o Engineering geology for a runway extension for the State of Alaska and the City of Unalaska at Dutch Harbor, Alaska.
- o Coordination of a drilling program covering 460 miles of the Trans-Alaska Pipeline System including drilling operations, laboratory testing, engineering analyses, and reporting.
- o Review of hazardous waste disposal areas and preparation and implementation of an investigation program at three major U.S. Air Force installations and five DEW Line sites in Alaska.
- o Coordination of onshore logistics for an offshore geotechnical investigation utilizing a 195-foot drill-equipped vessel operating in the Bering, Chukchi, and Beaufort seas.
- o Assessment of geohazards along State Route 178 in the Kern River Canyon, Kern County, California.
- o Soil and ground water contamination assessment for Chevron's Bakersfield, California refinery.
- o Assessment of hydrogeologic conditions in conjunction with a soil and ground water assessment at the Kodak Distribution Center, San Ramon, California.
- o Assessment of gasoline spills at a San Mateo, California gas station.

Past Experience

- o Senior Civil Engineer, Alyeska Pipeline Service Company. General civil engineering including engineering project management, soils investigations, below-ground pipeline stability monitoring, field visual surveillance of below-ground pipeline, development of computer systems for below-ground pipeline monitoring and stability analysis, and coordination of field test hole drilling and monitoring device installation programs. Mapping of ground water flow and flow control planning including through pump testing and water level monitoring.

Dames & Moore

- Owner, Geological Engineering Services. General geological and civil engineering including soils investigations, subdivision development engineering, water supply and sewage treatment and disposal systems design, road design, construction inspection, and environmental engineering.
- Manager of Kenai District Field Office, Alaska Department of Environmental Conservation. Responsible for review of plans for subdivisions, water supply systems and sewage treatment and disposal systems, inspection of public water supplies and wastewater treatment and disposal systems, enforcement of DEC regulations, and preparation of legal actions. Reviewed both chemical and oil waste disposal practices in the Sterling hazardous waste disposal area and plans for sewage disposal facilities in several areas on the Kenai Peninsula. Reviewed plans for fish waste disposal facilities in several areas on the Kenai Peninsula. Provided supervision for oil spill monitoring for south-central and southwest Alaska.
- Senior and Staff Engineer, R&M Consultants. Coordination of soils investigations, computer processing of data, preparation of numerous technical and data presentation reports, foundation investigations, and subdivision investigations.

Academic Background

Postgraduate courses in engineering and business management and arctic engineering, 1980-1982
B.S., Geological Engineering, University of Alaska, Fairbanks, 1974
Washington State University, Pullman, 1966-1967
University of Alaska, Fairbanks, 1965-1966

Registration

Professional Geologist, Alaska, License No. AA 0059, 1982

Professional Affiliations

American Institute of Professional Geologists, 1982, CPGS No. 6082
Association of Engineering Geologists
Association of Ground Water Scientists and Engineers
Alaska Section, American Water Resources Association
Alaska Ground Water Association (Secretary/Treasurer, 1983-1984)
Alaska Geological Society

Publications

Thomas, H.P., E.R. Johnson, J.M. Stanley, J.A. Shuster, and S.W. Pearson, "Pipeline Stabilization Project at Atigun Pass," in Proceedings of the Third International Symposium on Ground Freezing, Hanover, New Hampshire, June 1982.

Stanley, J.M., and J.E. Cronin, "Investigation and Implications of Subsurface Conditions Beneath the Trans-Alaska Pipeline in Atigun Pass," in Proceedings of the Fourth International Conference on Permafrost, July 1983 (in preparation).

nh-tl

Curriculum Vitae

KAY L. TAUSCHER

Title	Staff Geologist
Expertise	Geology Hydrogeology
Experience with Firm	Assistant Geologist, 1985-1987

- Investigated and completed hydrogeologic evaluations for the potential risks of leaking underground storage tanks at 56 sites across the nation.
- Performed geologic and ground water investigations of the Ashtabula, Ohio area.
- Completed hydrogeologic investigation of the Moscow, Ohio area for a large utility company.
- Analyzed data and prepared the report for a major coal conversion project in Ohio.
- Compiled a regulation assessment for underground storage tanks for 12 states and 20 localities across the nation.
- Supervised the installation, development, and sampling of monitoring wells, and took composite soil samples for laboratory analysis on potential burning grounds at an ammunitions plant in Joliet, Illinois.
- Completed field investigations on a PCB contamination site in Mentor, Ohio, which included drilling, soil sampling, and test pit operations.
- Participated in hydrogeologic field investigations at a chemical plant in Morris, Illinois.
- Completed sampling program of drums and underground storage tanks at an industrial site in Chicago, Illinois.
- Performed ground water and geologic investigations for a utility plant site in southeastern Ohio.
- Participated in onshore and offshore geotechnical field investigations at a utility site in Ashtabula, Ohio, which included drilling and test pit operations.
- Supervised geotechnical field work at a future road site in Schaumburg, Illinois.
- Completed geotechnical investigations for a future building foundation in the St. Louis, Missouri area.
- Sampled surface water, seeps, and soils for laboratory analysis at a chemical plant in Carpentersville, Illinois.
- Supervised boring investigations, monitoring well installation, and performed monitoring well sampling at a paper mill spray irrigation field in central Ohio.

- o Completed a reevaluation of a Hazard Ranking Score for a large industrial client's landfill that had been proposed for addition to the National Priorities List.
- o Participated in the field work for several large hydrogeologic investigations for United States Air Force facilities in Alaska.
- o Performed a site contamination assessment of a subsurface irrigation field in Woodstock, Illinois.

Staff Geologist, 1987

- o Managed and completed a second phase hydrogeologic investigation and ground water monitoring program for a paper mill wastewater spray field in central Ohio.
- o Managed and assisted in the design of a three-phased site contamination assessment of an abandoned railyard in Chicago, Illinois.
- o Designed and managed a site contamination assessment of a 120-acre railyard in Schiller Park, Illinois.
- o Assisted in the design and management of a hydrogeologic contamination investigation near Reed City, Michigan.

Academic Background

Coursework completed toward M.S. with emphasis in sedimentology and clay mineralogy, University of Cincinnati, Ohio.

B.S., Geology, 1983, University of Louisville, Kentucky.

Undergraduate coursework in civil engineering, Vanderbilt University, Nashville, Tennessee.

Awards

University Graduate Scholarship, 1984, University of Cincinnati
University Graduate Scholarship, 1985, University of Cincinnati

Publications

Co-authored a paper on "Prioritizing Your Underground Storage Tanks," to be presented at the 1987 American Society of Civil Engineers National Conference on Environmental Engineering, Orlando, Florida

Language Proficiency

English
German

Other Work-Related Activity

Completing coursework toward P.A.D.I. Dive Master (SCUBA)

Seminars

Participated in Dames & Moore Health and Safety Seminar (1985)
Attended a USEPA Ground Water Seminar Series (1987)

nr-ts

APPENDIX L

GEOPHYSICAL TRACINGS

EM SURVEY DATA FOR LINE 1

READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING	NORTH COORD	CONDUCTIVITY READING	NORTH COORD	CONDUCTIVITY READING
0	4.5	1025	7.1	2050	4.2
25	4.1	1050	6.8	2075	3.0
50	4.1	1075	6.0	2100	2.7
75	3.4	1100	6.2	2125	2.5
100	3.1	1125	6.3	2150	2.3
125	3.8	1150	5.9	2175	2.15
150	6.2	1175	5.3	2200	2.0
175	0.0	1200	5.6	2225	2.0
200	7.4	1225	5.9	2250	1.9
225	5.5	1250	5.8	2275	1.8
250	5.1	1275	6.2	2300	1.7
275	5.2	1300	6.2	2325	1.6
300	6.3	1325	5.4	2350	1.35
325	6.8	1350	4.9	2375	1.5
350	5.9	1375	4.5	2400	1.35
375	5.2	1400	4.4	2425	1.3
400	5.0	1425	4.0	2450	1.4
425	5.6	1450	4.3	2475	1.4
450	5.2	1475	4.4	2500	1.45
475	0.3	1500	4.6	2525	1.5
500	3.8	1525	4.5	2550	1.85
525	3.0	1550	4.9	2575	2.8
550	2.9	1575	5.3	2600	5.3
575	2.7	1600	4.6	2625	5.3
600	2.7	1625	4.7	2650	4.7
625	3.4	1650	4.3	2675	4.2
650	2.5	1675	4.2	2700	3.2
675	3.3	1700	4.1	2725	3.4
700	3.5	1725	4.0	2750	3.5
725	3.6	1750	3.6	2775	2.8
750	3.8	1775	3.2	2800	3.2
775	3.8	1800	3.2	2825	2.9
800	4.3	1825	2.8	2850	3.4
825	4.1	1850	2.9	2875	3.6
850	4.0	1875	2.8	2900	3.5
875	4.7	1900	3.2	2925	3.3
900	8.0	1925	3.1	2950	2.8
925	8.5	1950	3.0	2975	2.05
950	9.4	1975	2.5	3000	1.8
975	13.8	2000	3.3	3025	2.35
1000	11.9	2025	3.5	3050	2.1
				3075	1.7

EM SURVEY DATA FOR LINE 2

READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING	NORTH COORD	CONDUCTIVITY READING
0	26.0	900	5.1
25	18.5	925	5.2
50	4.5	950	3.9
75	3.2	975	3.9
100	3.0	1000	3.7
125	2.95	1025	3.7
150	3.1	1050	3.5
175	3.1	1075	3.6
200	3.1	1100	3.2
225	3.2	1125	3.4
250	3.2	1150	2.8
275	3.4	1175	2.25
300	3.4	1200	2.5
325	3.5	1225	2.1
350	3.0	1250	2.4
375	3.7	1275	3.0
400	3.7	1300	2.7
425	3.6	1325	2.6
450	3.6	1350	2.5
475	3.3	1375	2.2
500	4.1	1400	2.3
525	6.0	1425	1.95
550	6.3	1450	2.05
575	6.3	1475	2.45
600	6.0	1500	3.1
625	5.9	1525	4.8
650	6.3	1550	5.0
675	6.1	1575	4.5
700	5.8	1600	3.0
725	5.4	1625	3.4
750	5.6	1650	3.0
775	5.5	1675	4.4
800	5.4	1700	3.7
825	5.4	1725	4.8
850	5.1	1750	5.3
875	5.2	1775	3.6
		1800	2.6
		1825	1.7
		1850	1.15
		1875	1.4

EM SURVEY DATA FOR LINE 3

READINGS IN millimhos per meter

EAST COORD	CONDUCTIVITY READING
0	4.8
-25	5.4
-50	6.2
-75	7.5
-100	7.8
-125	5.9
-150	4.6
-175	4.1
-200	4.4
-225	4.3
-250	4.4
-275	4.1
-300	4.2
-325	9.1
-350	2.4
-375	16.5
-400	25.0
-425	21.0
-450	26.0
-475	21.0
-500	9.4
-525	4.2
-550	3.2
-575	2.6
-600	3.3
-625	3.1
-650	5.3
-675	0.0
-700	0.0
-725	3.8
-750	3.1
-775	2.4
-800	1.95
-825	0.0
-850	1.2
-875	1.15
-900	1.45
-925	2.1
-950	2.5
-975	4.3
-990	16.0

EM SURVEY DATA FOR LINE 4

READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING
-300	1.8
-275	1.7
-250	1.85
-225	2.05
-200	2.2
-175	2.05
-150	1.95
-125	2.1
-100	2.5
-75	3.3
-50	2.75
-25	2.85
0	2.45
25	2.7
50	2.95
75	4.2
100	0.45
125	7.6
150	3.4
175	2.75
200	2.5
225	2.5
250	2.8
275	3.0
300	4.0
325	0.0
350	6.6
375	5.8
400	12.0
425	10.5
450	6.2
475	11.0
500	10.0
525	8.8
550	9.0
575	7.4
600	1.65

EM SURVEY DATA FOR LINE 5
READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING
0	2.6
25	2.75
50	2.8
75	4.0
100	6.0
125	8.4
150	3.8
175	3.1
200	3.7
225	4.0
250	5.2
275	6.0
300	6.7
325	9.2
350	19.0
375	6.2
400	5.1
425	4.4
450	5.3
475	5.9
500	5.2
525	5.9
550	7.3
575	9.1
600	8.0
625	6.6
650	5.7
675	6.9
700	6.8
725	7.5
750	5.6
775	4.7
800	4.9
825	5.7
850	5.2
875	6.2
900	6.2
925	4.9
950	7.1
975	6.8
1000	7.5
1025	6.0
1050	5.3
1075	5.5
1100	6.6
1125	7.6
1150	8.1
1175	8.4
1200	10.5
1225	9.2
1250	8.6

EM SURVEY DATA FOR LINE 6
READINGS IN millimhos per meter

EAST COORD	CONDUCTIVITY READING	EAST COORD	CONDUCTIVITY READING
0	8.6	-775	3.2
-25	11.5	-800	3.0
-50	13.0	-825	3.0
-75	18.5	-850	3.1
-100	21.5	-875	3.2
-125	24.5	-900	3.5
-150	27.5	-925	3.3
-175	27.0	-950	3.2
-200	23.0	-975	2.9
-225	21.5	-1000	3.0
-250	14.0	-1025	2.6
-275	11.5	-1050	2.7
-300	10.5	-1075	2.8
-325	7.1	-1100	2.7
-350	4.1	-1125	2.65
-375	3.2	-1150	2.7
-400	3.0	-1175	2.7
-425	3.1	-1200	2.6
-450	2.75	-1225	2.6
-475	2.55	-1250	2.6
-500	2.7	-1275	2.45
-525	2.4	-1300	2.35
-550	2.4	-1325	2.00
-575	2.45	-1350	1.9
-600	2.4	-1375	1.75
-625	2.8	-1400	1.65
-650	2.95	-1425	2.55
-675	2.5	-1450	1.85
-700	2.5	-1475	1.4
-725	2.7	-1500	1.1
-750	3.2		

EM SURVEY DATA FOR LINE 7

READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING
0	12.5
25	20.0
50	14.5
75	7.1
100	4.7
125	5.0
150	5.6
175	4.9
200	4.1
225	4.6
250	5.9
275	6.9
300	6.8
325	6.1
350	6.5
375	5.6
400	6.1
425	6.4
450	5.2
475	5.6
500	5.6
525	5.1
550	5.7
575	5.6
600	6.0
625	5.6
650	6.3
675	6.7
700	6.1
725	6.2
750	5.2
775	4.8
800	5.4
825	4.8
840	4.1
875	3.5

EM SURVEY DATA FOR LINE 8

READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING	NORTH COORD	CONDUCTIVITY READING
0	1.15	1125	1.8
25	1.25	1150	1.85
50	1.2	1175	1.7
75	1.35	1200	1.6
100	1.4	1225	1.5
125	1.55	1250	1.45
150	1.55	1275	1.55
175	1.7	1300	1.6
200	1.55	1325	1.6
225	1.4	1350	2.05
250	1.3	1375	3.4
275	1.5	1400	2.5
300	0.7	1425	2.45
325	1.5	1450	2.7
350	1.2	1475	2.85
375	1.4	1500	2.6
400	1.3	1525	2.1
425	1.4	1550	2.05
450	1.3	1575	1.7
475	1.4	1600	1.7
500	1.6	1625	1.3
525	1.5	1650	2.0
550	1.7	1675	2.35
575	1.8	1700	1.95
600	1.2	1725	1.4
625	1.25	1750	2.05
650	1.6	1775	2.1
675	1.8	1800	2.05
700	1.6	1825	1.95
725	1.55	1850	2.1
750	1.5	1875	2.2
775	1.5	1900	2.05
800	1.6	1925	2.25
825	2.1	1950	1.95
850	2.4	1975	1.9
875	2.25	2000	1.7
900	2.5	2025	1.95
925	2.1	2050	2.15
950	1.55	2075	1.7
975	2.0	2100	1.8
1000	0.0	2125	1.9
1025	2.4	2150	1.75
1050	2.7	2175	2.1
1075	2.1	2200	1.85
1100	2.2	2225	1.75
		2250	1.7

EM SURVEY DATA FOR LINE 8

READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING
2275	1.85
2300	1.85
2325	1.75
2350	1.5
2375	1.6
2400	1.65
2425	2.0
2450	2.05
2475	2.85
2500	3.3
2525	3.85
2550	4.0
2575	4.4
2600	4.0
2625	3.3
2650	3.2
2675	3.1
2725	2.9
2750	3.2
2775	3.4
2800	3.8
2825	2.5
2850	2.1
2875	2.0

EM SURVEY DATA FOR LINE 9

READINGS IN millimhos per meter

EAST COORD	CONDUCTIVITY READING
0	2.6
-25	2.5
-50	2.25
-75	2.35
-100	2.50
-125	2.3
-150	2.1
-175	2.0
-200	2.2
-225	2.45
-250	2.5
-275	2.6
-300	2.6
-325	2.7
-350	2.7
-375	2.2
-400	2.3
-425	2.15
-450	2.3
-475	2.1
-500	2.0
-525	1.9

EM SURVEY DATA FOR LINE 10

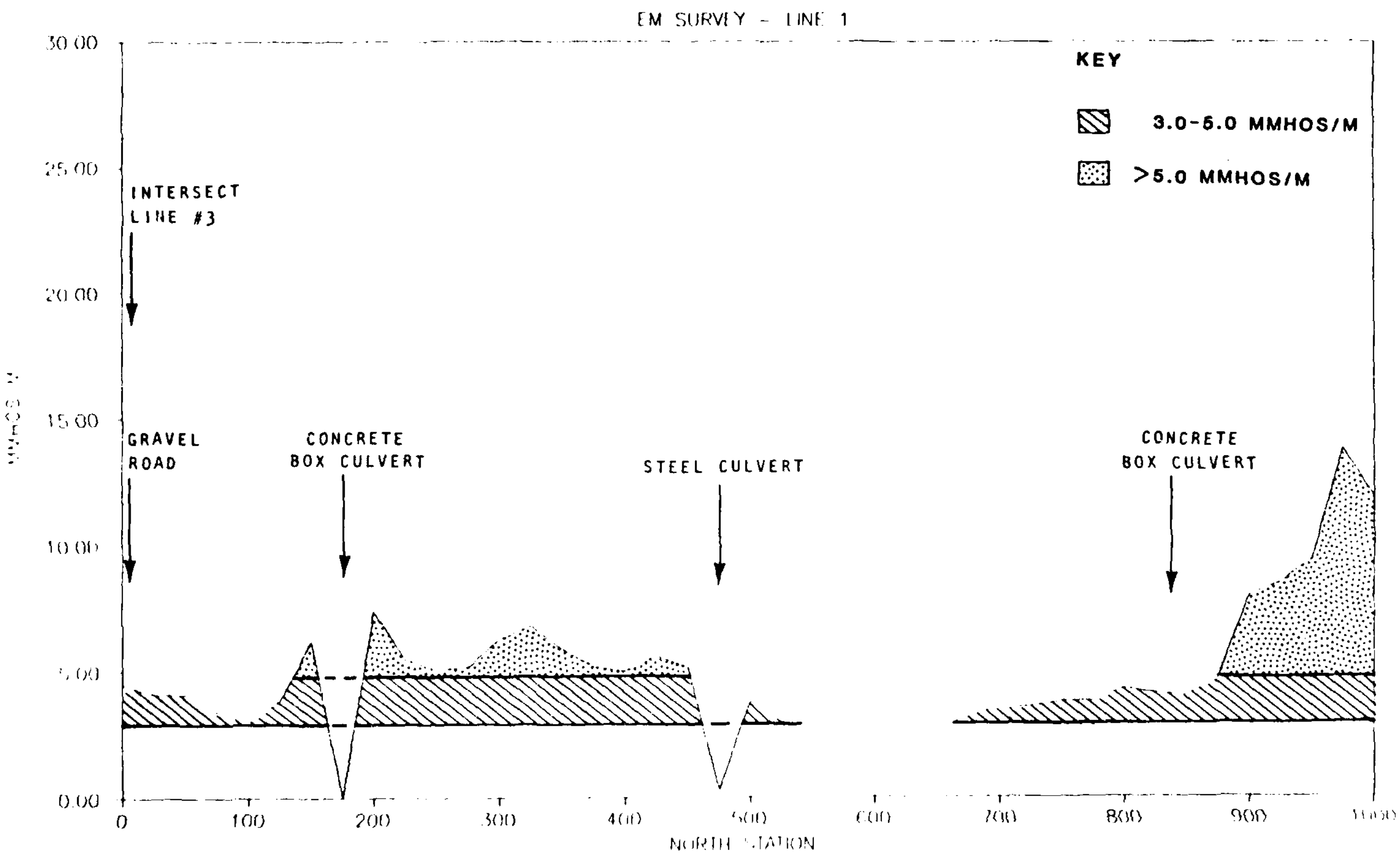
READINGS IN millimhos per meter

NORTH COORD	CONDUCTIVITY READING
0	2.8
25	3.4
50	3.0
75	3.0
100	3.1
125	3.3
150	3.3
175	3.4
200	3.3
225	3.6
250	3.9
275	3.7
300	3.2
325	3.3
350	3.4
375	3.7
400	3.0
425	3.2
450	3.2
475	2.9
500	2.9
525	2.8
550	2.55
575	2.65
600	2.5
625	3.3
650	4.3
675	4.6
700	3.5
725	2.85
750	2.5
775	2.9
800	3.3
825	4.4
850	4.4
875	3.5
900	3.5
925	3.2
950	3.4
975	4.6
1000	3.9
1025	3.3

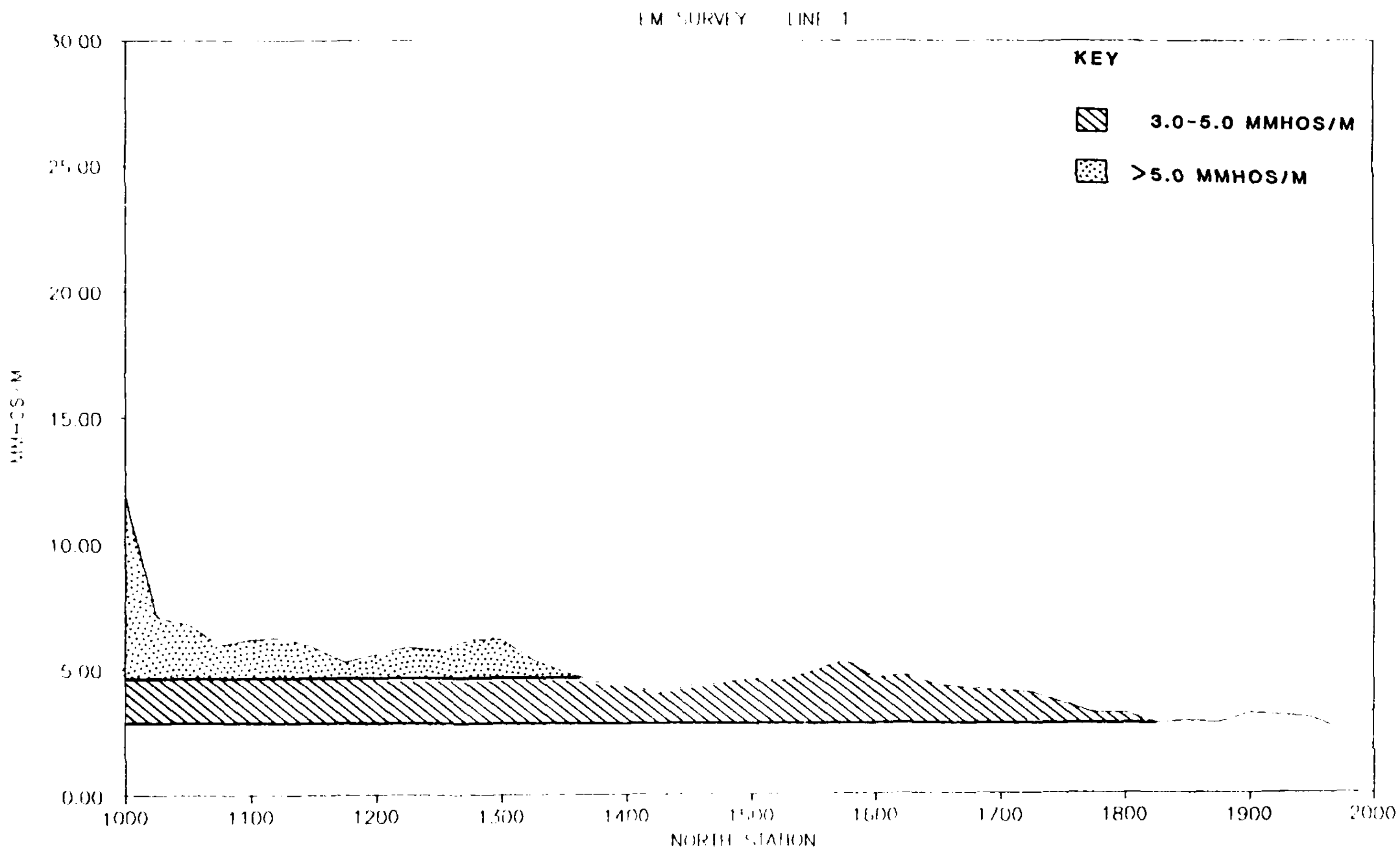
EM SURVEY DATA FOR LINE 11

READINGS IN millimhos per meter

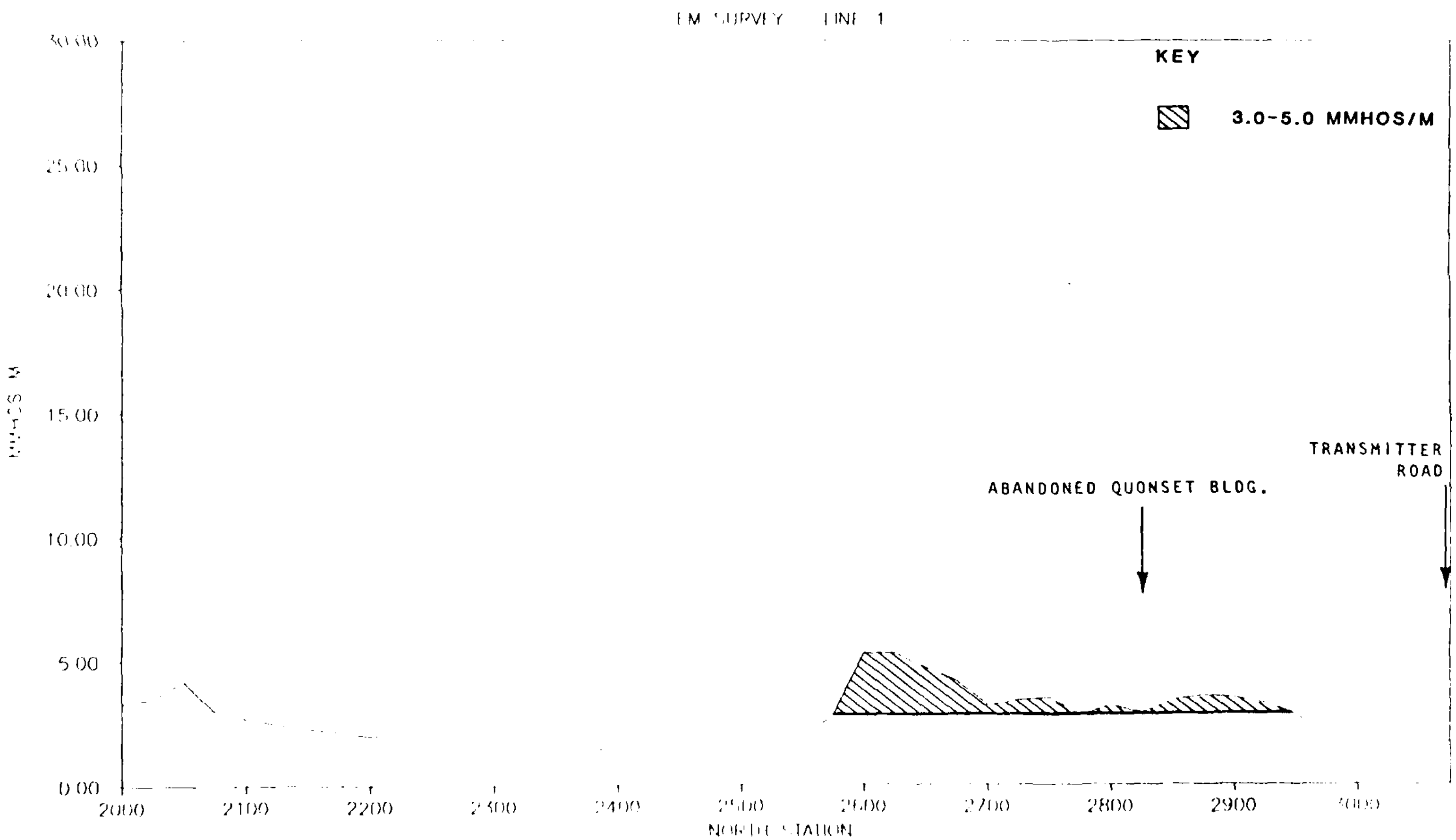
EAST COORD	CONDUCTIVITY READING
0	3.3
-25	2.6
-50	4.4
-75	3.1
-100	3.8
-125	3.3
-150	2.8
-175	2.6
-200	2.6
-225	2.35
-250	2.15
-275	2.0
-300	1.8
-325	1.8
-350	1.7
-375	1.7
-400	1.9
-425	1.9
-450	1.25
-475	1.7



LINE 1-A PLATE L-1

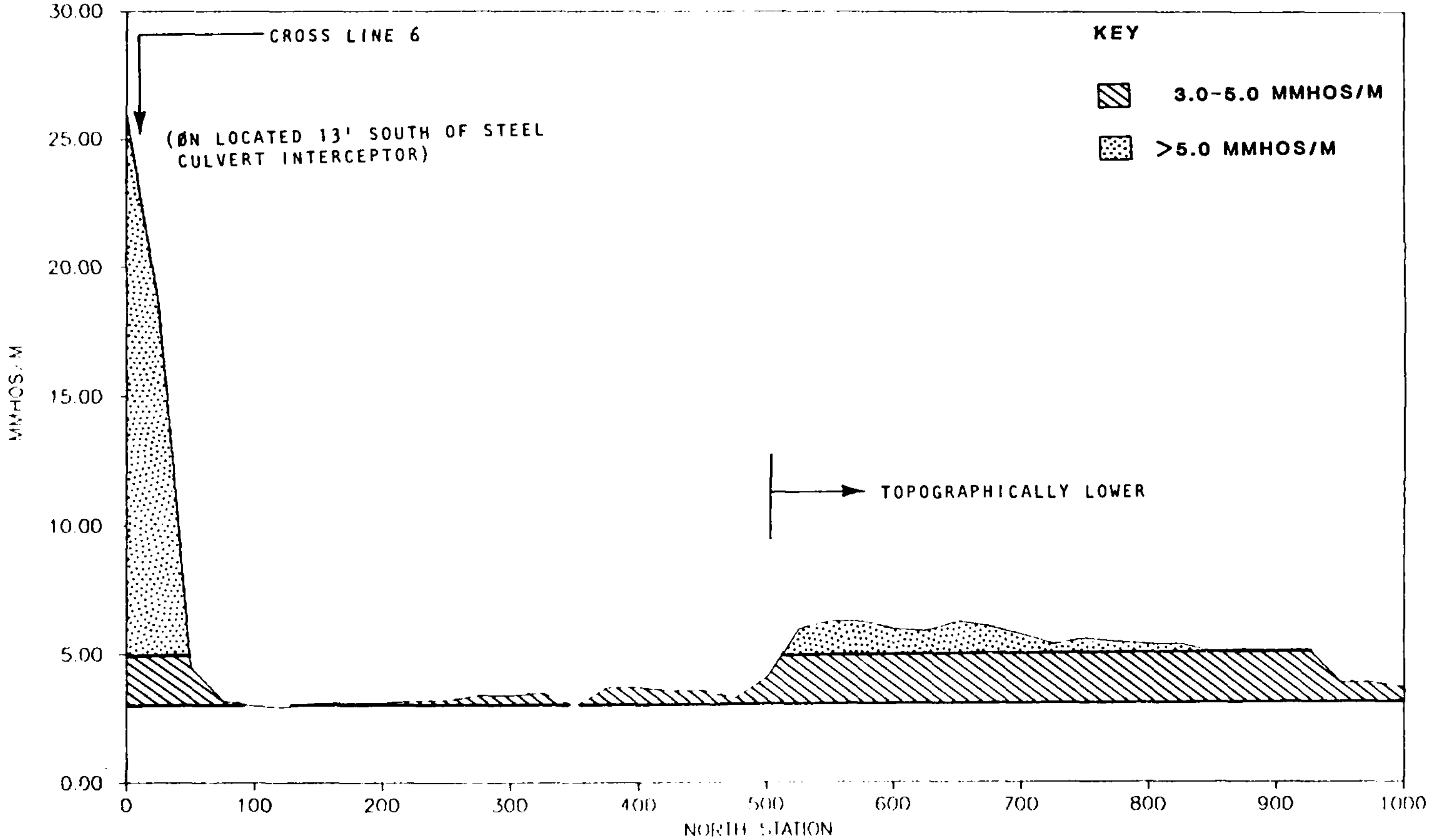


LINE 1-B PLATE L-2



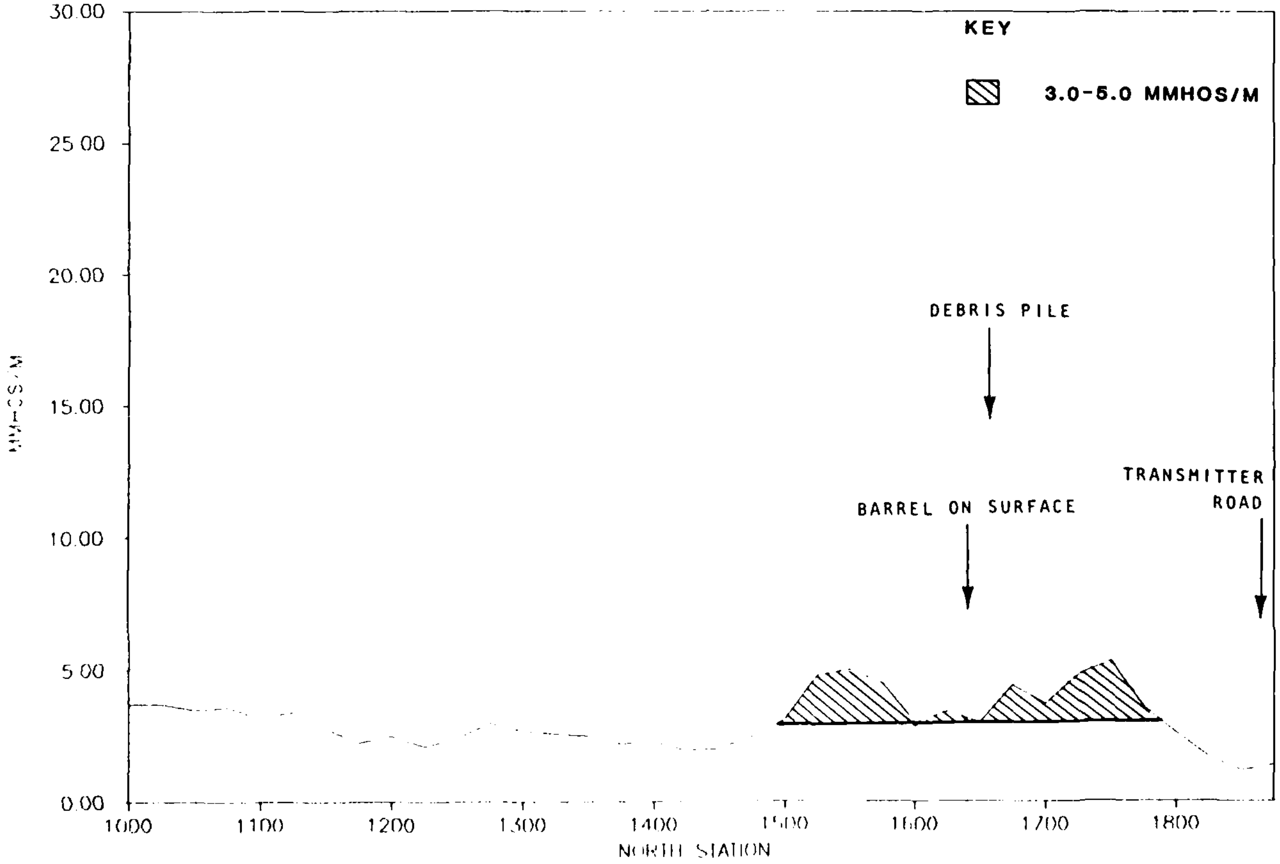
LINE 1-C PLATE L-3

EM SURVEY - LINE 2

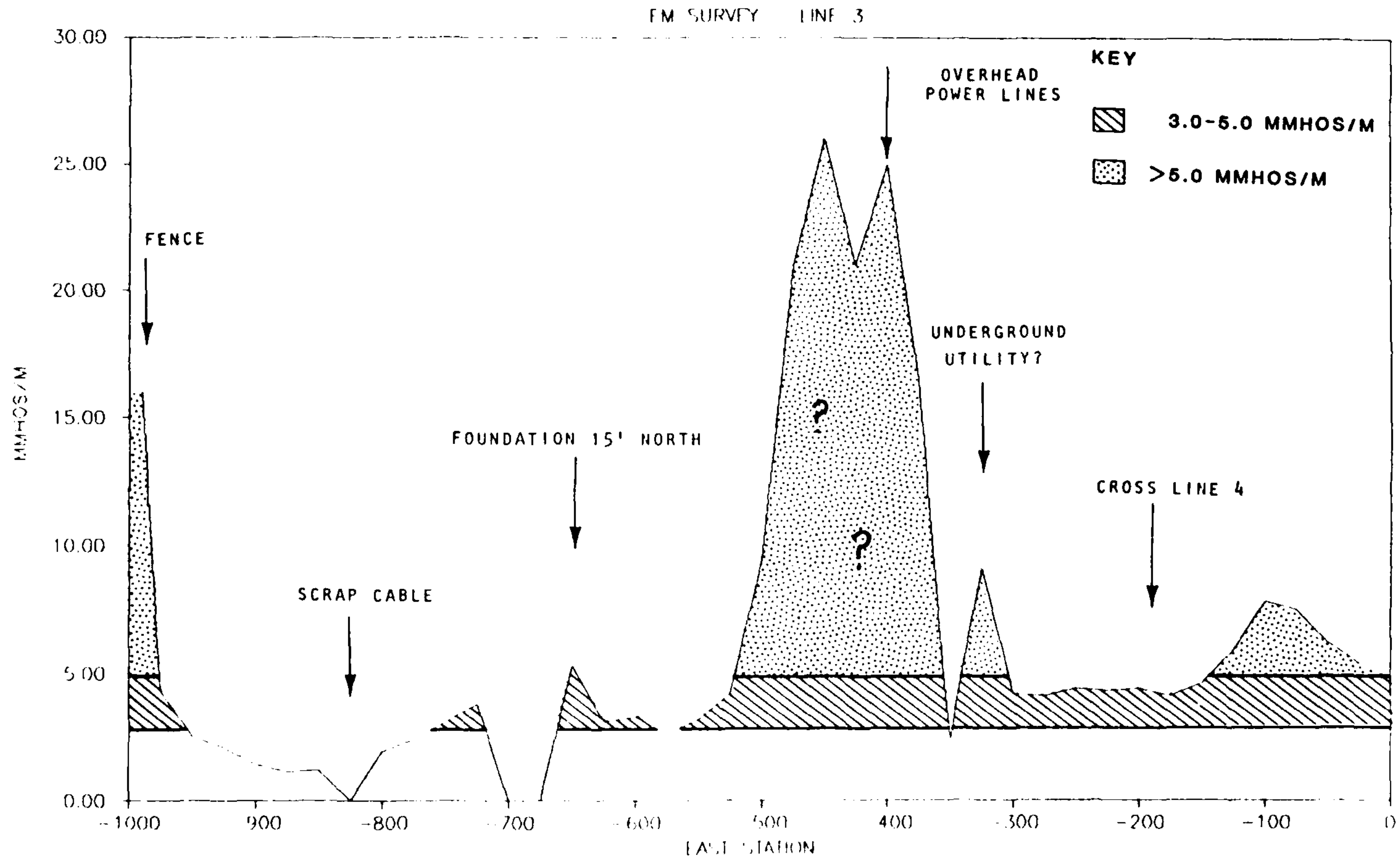


LINE 2-A PLATE L-4

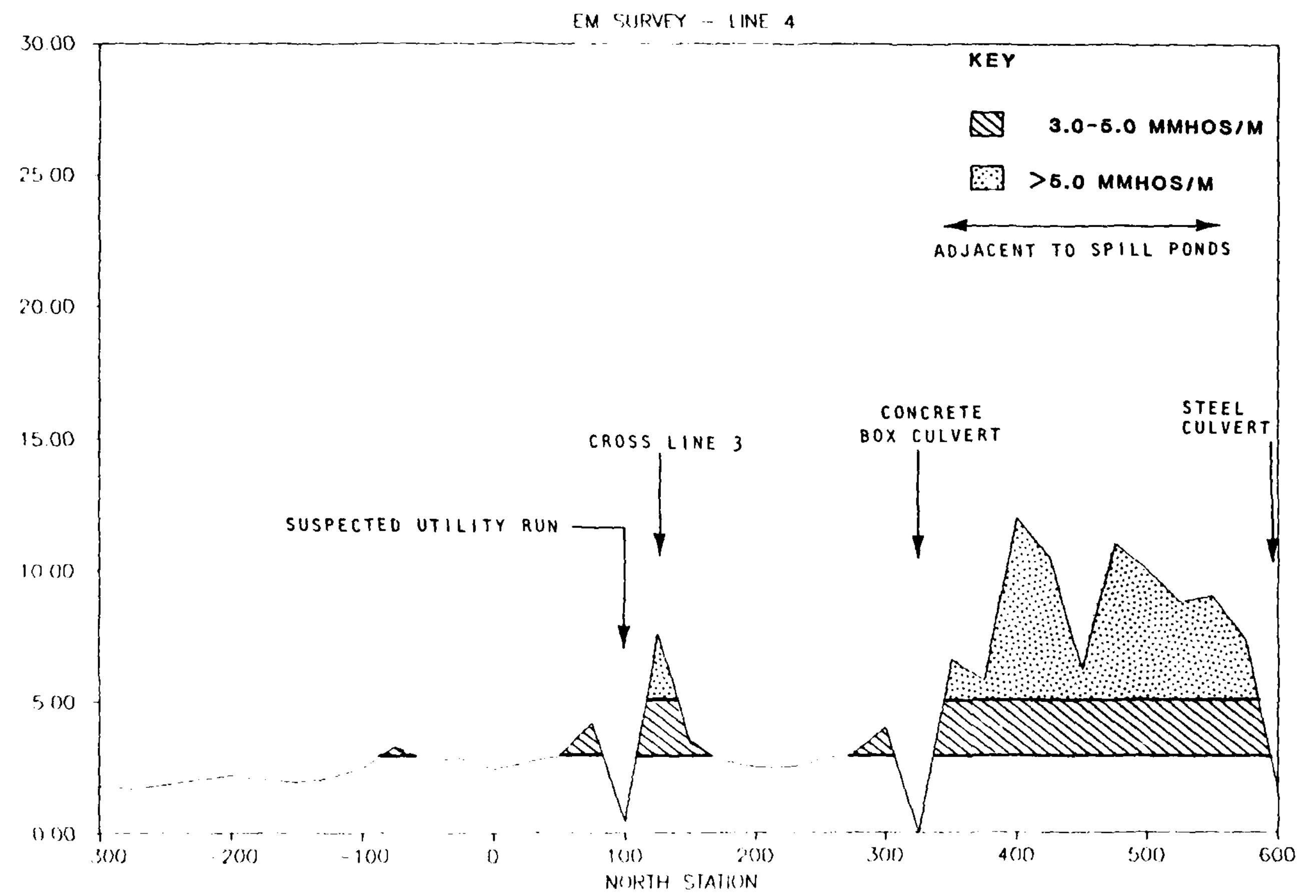
EM SURVEY - LINE 2



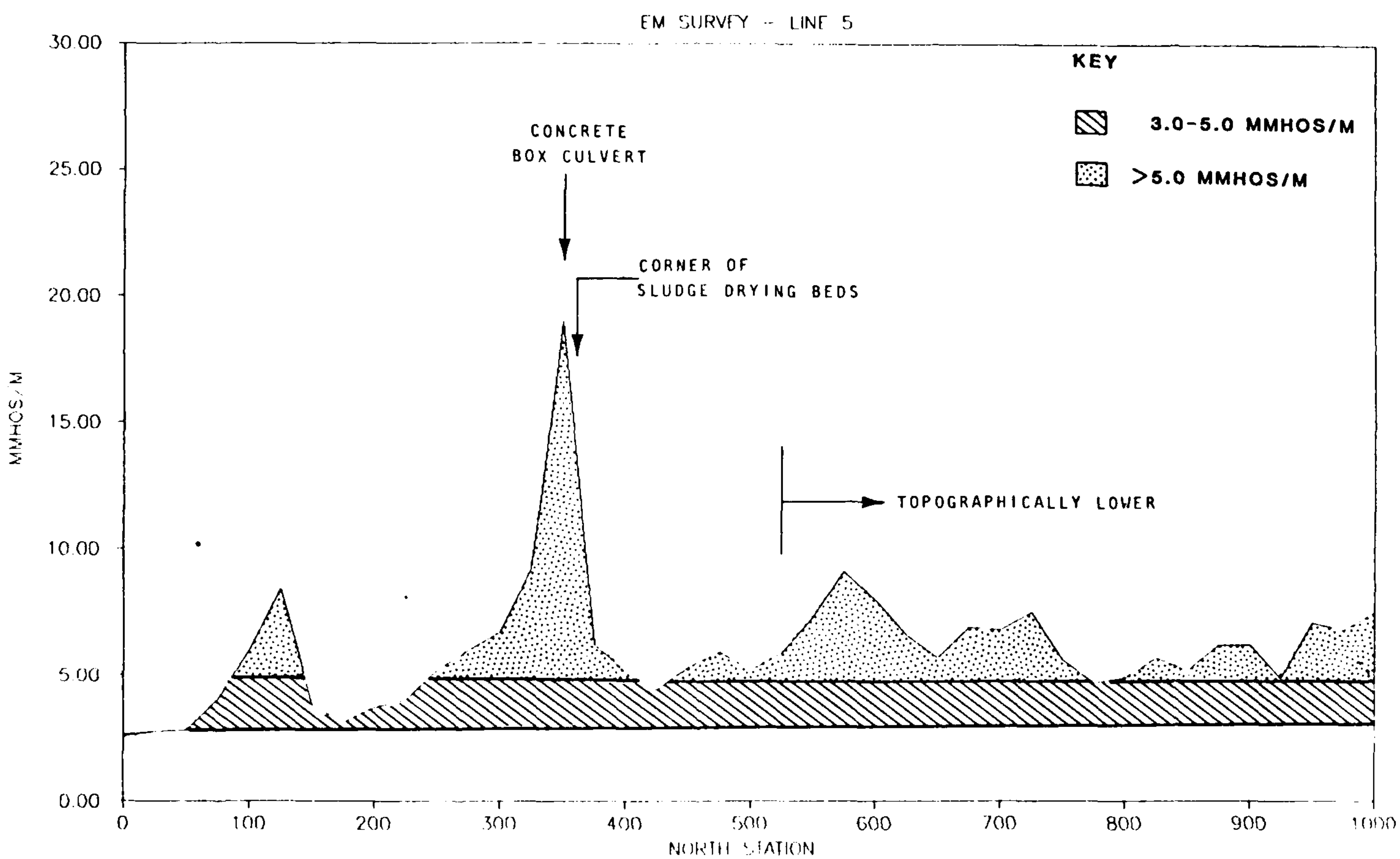
LINE 2-B PLATE L-5



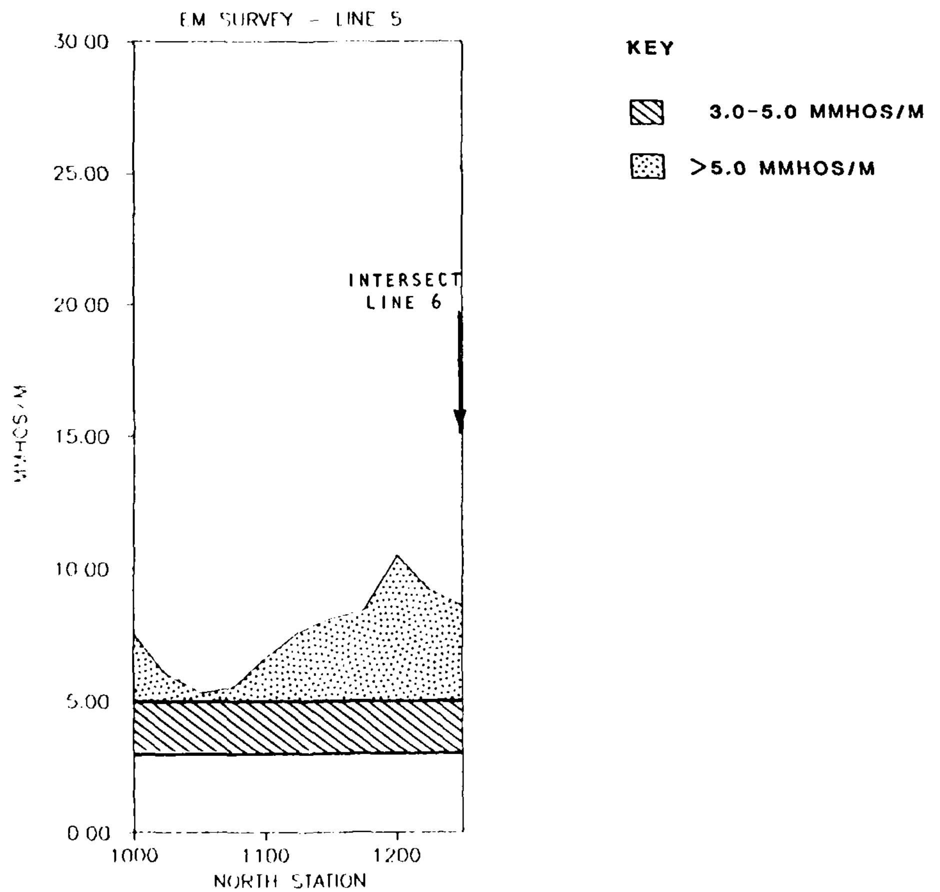
LINE 3-A PLATE L-6



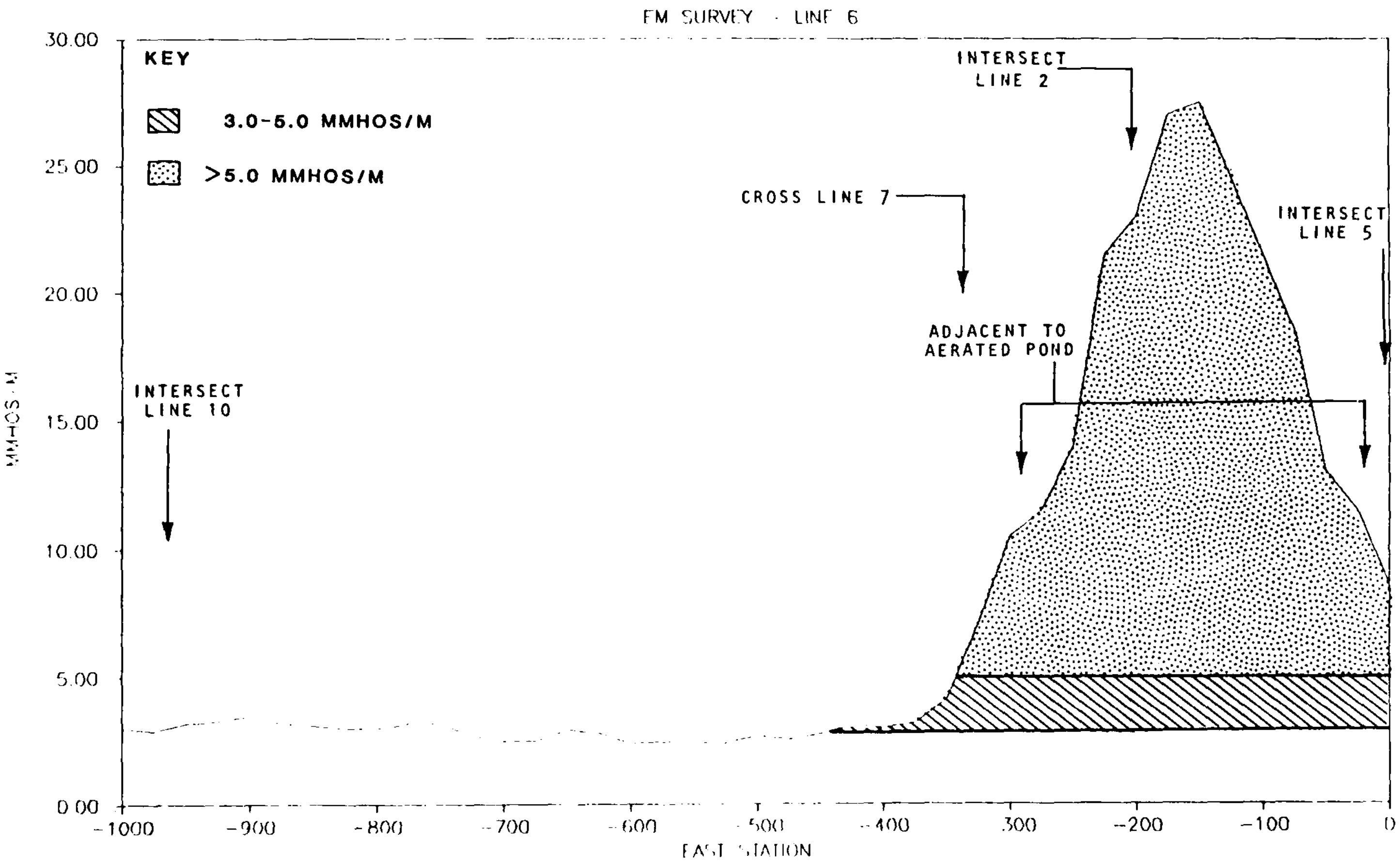
LINE 4-A PLATE L-7



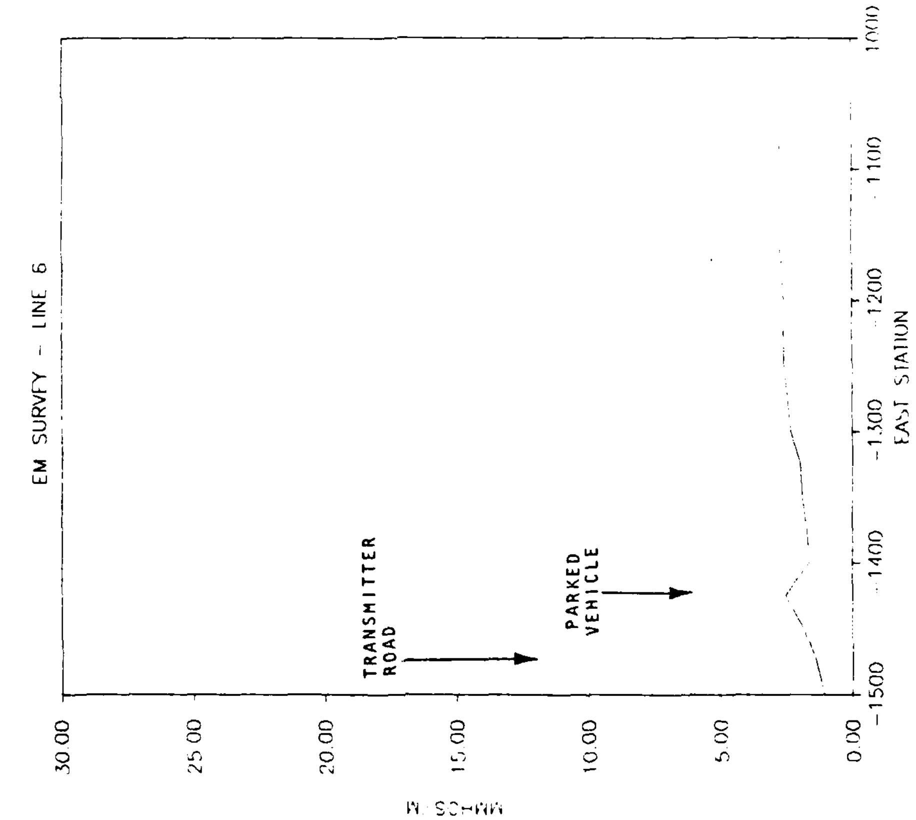
LINE 5-A PLATE L-8



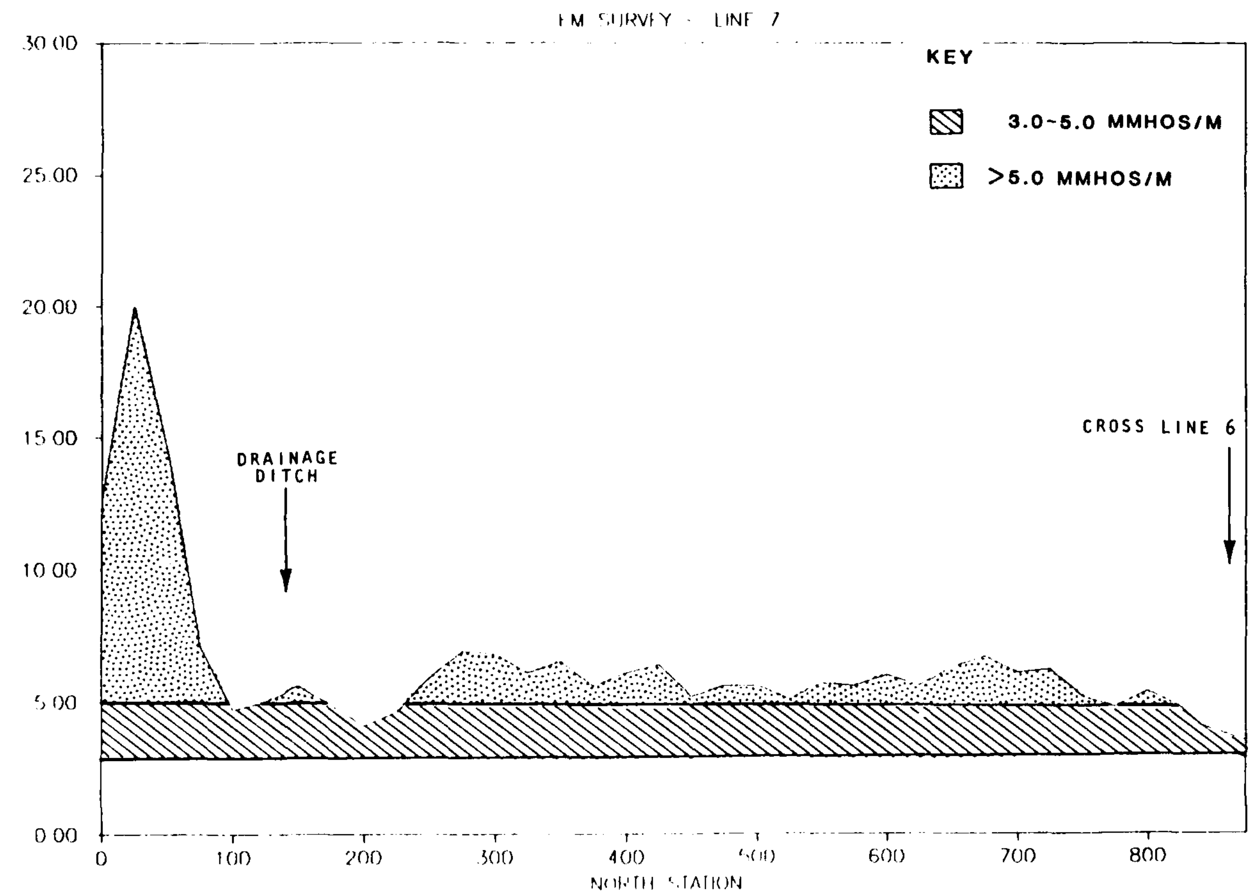
LINE 5-B PLATE L-9



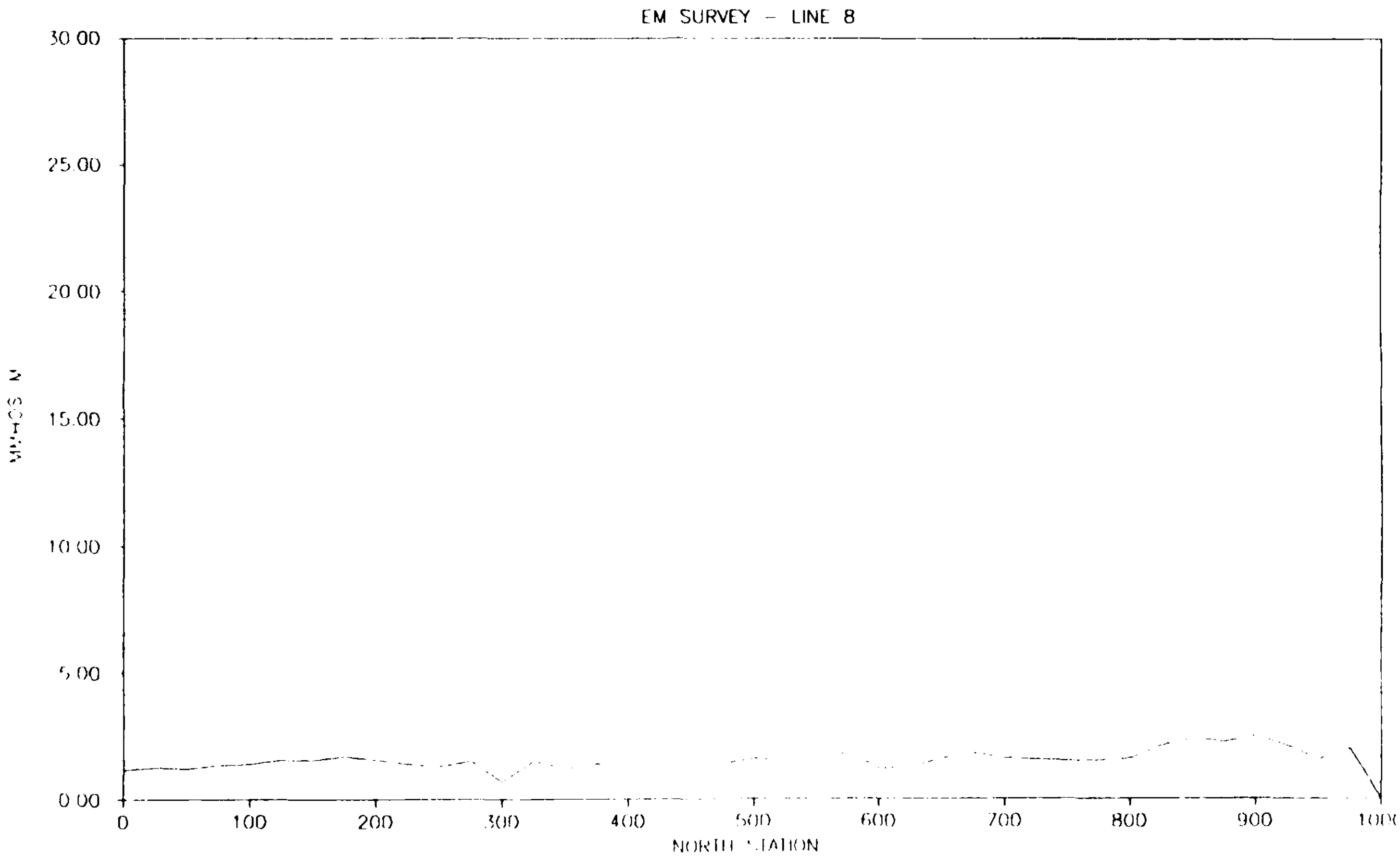
LINE 6-A PLATE L-10



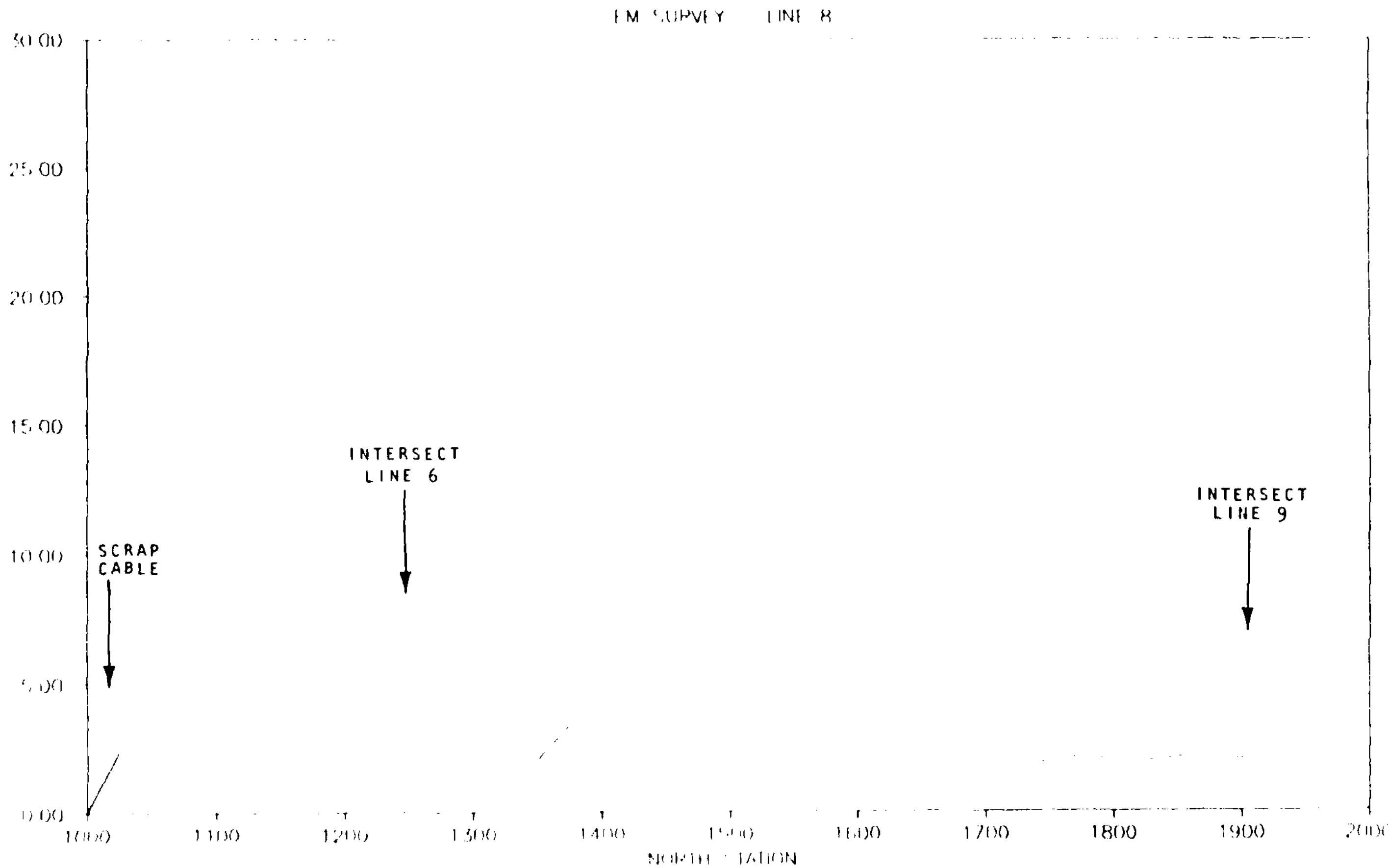
LINE 6-B PLATE L-11



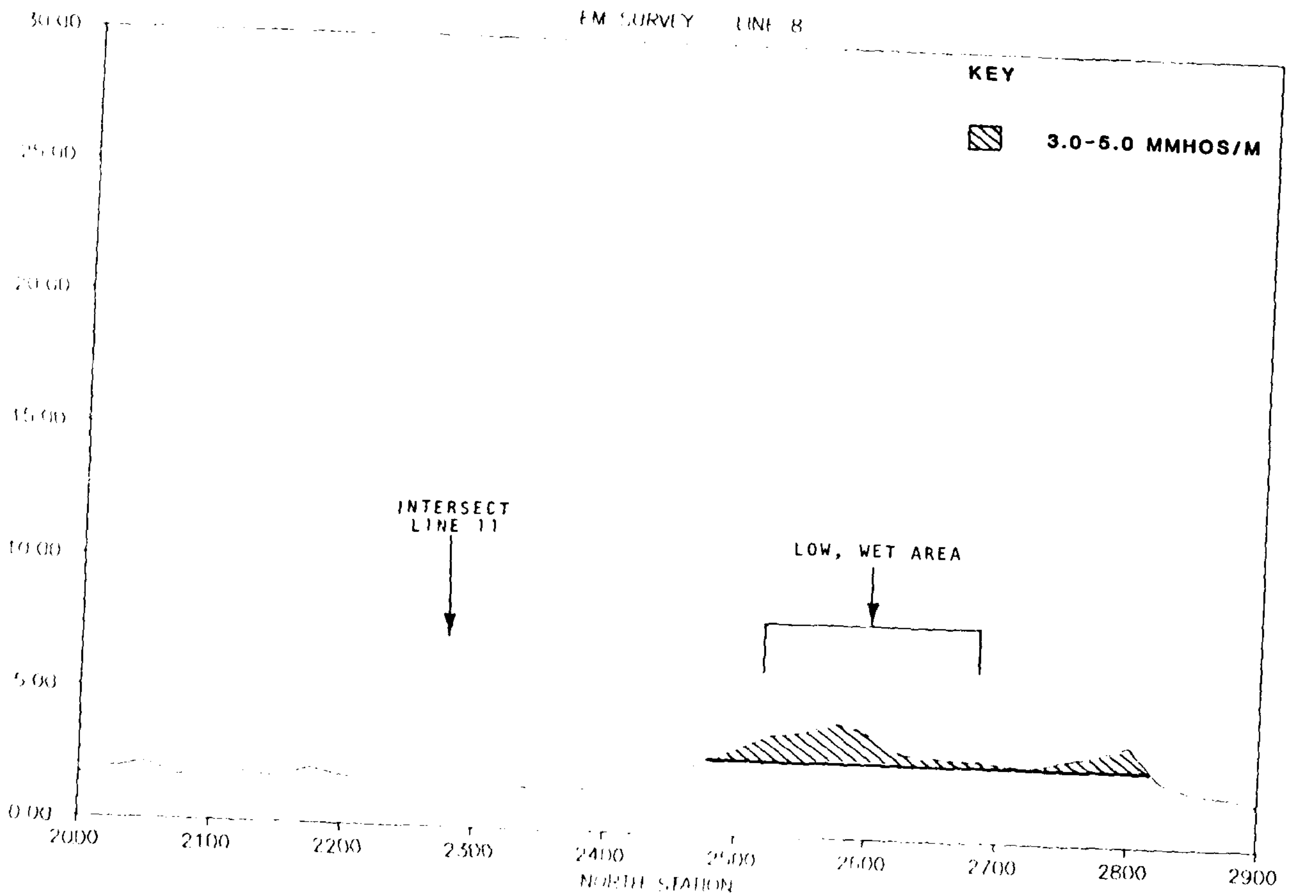
LINE 7-A PLATE L-12



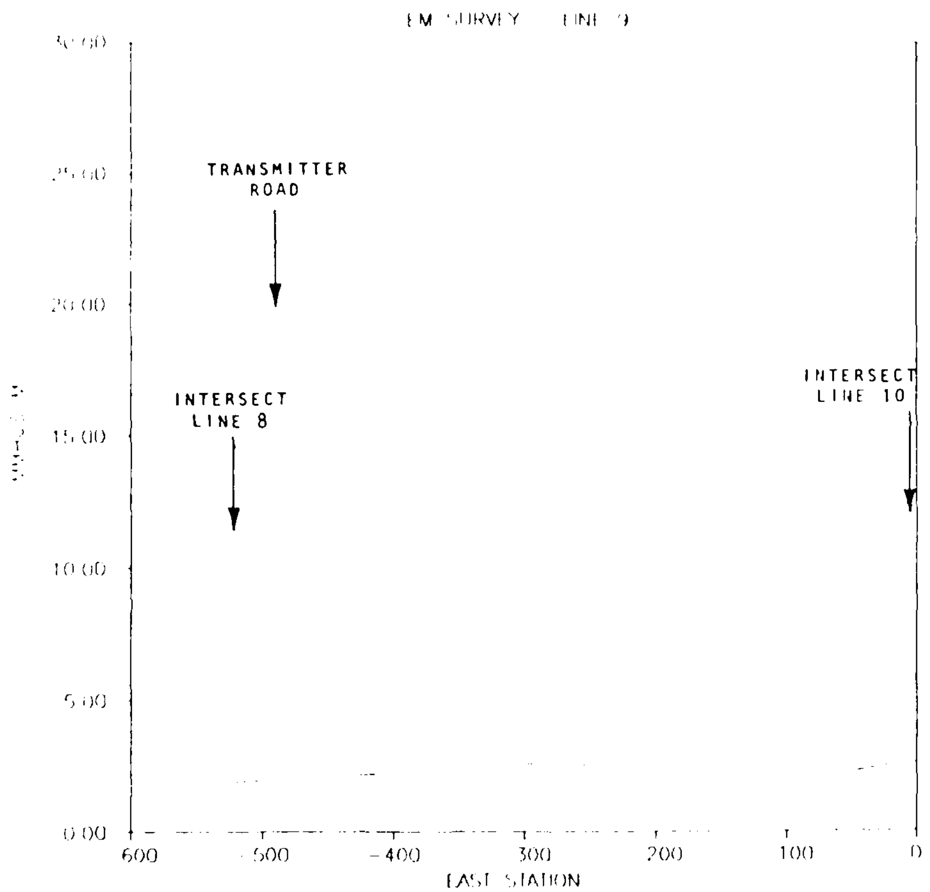
LINE 8-A PLATE L-13



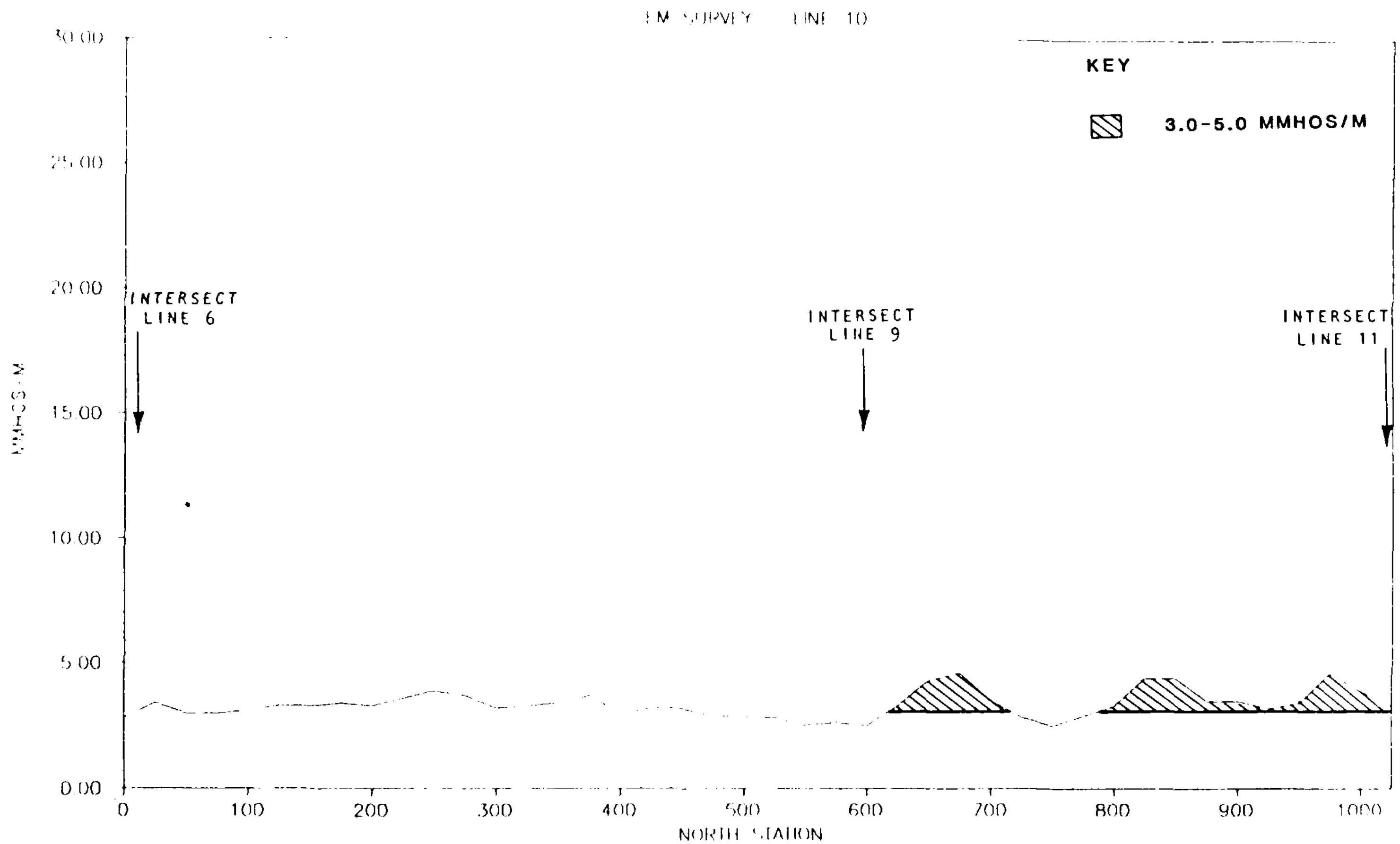
LINE 8-B PLATE L-14



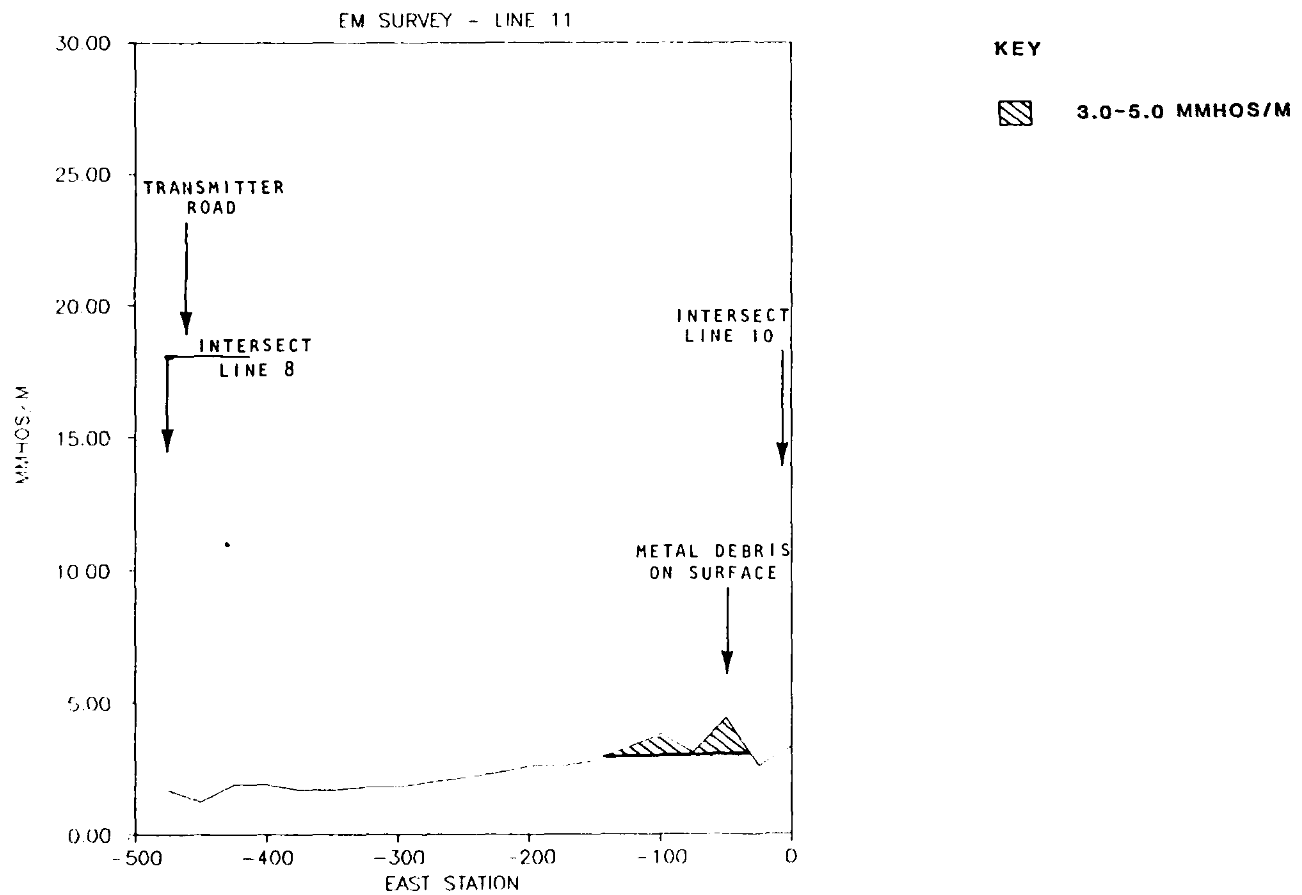
LINE 8-C PLATE L-15



LINE 9-A PLATE L-16



LINE 10-A PLATE L-17



LINE 11-A PLATE L-18

APPENDIX M

DAMES & MOORE TECHNICAL OPERATIONS PLAN (TOP)
AND HEALTH AND SAFETY PLAN

INSTALLATION RESTORATION PROGRAM

PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 2

TECHNICAL OPERATIONS PLAN FOR

EIELSON AFB, ALASKA

ALASKA AIR COMMAND

AUGUST 21, 1986

PREPARED BY

DAMES & MOORE
1550 NORTHWEST HIGHWAY
PARK RIDGE, ILLINOIS 60068

CONTRACT NO. F33615-83-D-4002, Order 0037

OEHL TECHNICAL MONITOR: Dr. DeeAnn Sanders

PREPARED FOR

UNITED STATES AIR FORCE

OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL)

BROOKS AIR FORCE BASE, TEXAS 78235

D&M Job No. 01016-261-007

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF PLATES, FIGURES AND TABLES

TECHNICAL OPERATIONS PLAN
INSTALLATION RESTORATION PROGRAM, PHASE II, STAGE 2
EIELSON AIR FORCE BASE, ALASKA

1.0 INTRODUCTION

This Technical Operations Plan (TOP) describes the methods and procedures that will be used to accomplish the objectives of the Phase II, Stage 2 field investigation of the United States Air Force (USAF) Installation Restoration Program (IRP) for Eielson Air Force Base (AFB), Alaska. The IRP is a nationwide effort intended to identify, evaluate the extent of, and mitigate environmental contamination potentially induced by the mobilization and migration of hazardous or toxic chemicals from past disposal or other handling practices at USAF facilities. On the basis of the findings of the Phase I study (CH2M Hill, 1982) and the Phase II, Stage 1 Problem Confirmation Study (Dames & Moore, 1986), the USAF Occupational and Environmental Health Laboratory (OEHL) retained Dames & Moore under Contract No. F33615-83-D-4002, Order No. 0037, to conduct a Phase II, Stage 2 study at Eielson AFB.

The Phase I and Phase II, Stage 1 reports were carefully reviewed, and their recommendations for the Phase II, Stage 2 program were considered.

1.1 PURPOSE AND SCOPE

The purpose of the TOP is to detail the methods and procedures that will be used to accomplish the tasks defined during the Stage 2 Investigation at Eielson AFB. Guidelines of the Occupational Health and Safety Administration (OSHA), United States Environmental Protection Agency (USEPA), and USAF, as well as previous investigations at Eielson AFB, were reviewed to select the methods that would be most appropriate for this investigation. The TOP is designed primarily to give guidance to personnel in the field and to ensure that standard methods of investigation are used. However, not all field problems can be anticipated, and the field personnel must exercise professional judgment when applying the guidelines.

The purpose of the Phase II Stage 2 investigation at Eielson AFB, as described in this TOP, is to conduct a field investigation, with subsequent laboratory analysis of collected samples, data interpretation and reporting, to accomplish the following objectives.

- Confirm the presence of suspected contamination within the specified areas of investigation;

- Determine the magnitude of contamination and the potential for migration of those contaminants in various environmental media;

- Identify public health and environmental hazards of migration pollutants based on State or Federal Standards for those contaminants; and

- Delineate additional investigations required beyond this stage to reach the Phase II objectives.

The Stage 2 effort at Eielson will involve additional investigations of the following Stage 1 sites:

- Sewage Treatment Plant Spill Ponds: Site 32;

- Old Base Landfill: Site 2; and

- Original Base Landfill: Site 1.

The Fuel Saturated Area, Sites 10, 11, 13-20, 36, 37, 41, and current base landfill; Site 3, are being investigated as a Phase IV action, and will not be addressed in this Technical Operations Plan.

The recommended program requires the installation of 8 aditional ground water monitoring wells and 4 soil borings. Sampling for chemical constituent analysis will be conducted at the 8 new monitoring wells, and 4 existing monitoring wells (W-2, W-7, W-8, and W-9), for the parameters listed in Table 1-1. In addition, Electromagnetic mapping surveys (EM) will be performed at Site 32, to determine the areal extent of any contaminant plume that is present. Results of those surveys will be used to position new downgradient monitoring wells.

TABLE 1-1

ANALYTICAL PROGRAM

PARAMETER	METHOD EXTRACTION/ ANALYSIS	WATER Site 3	WATER Site 32	WATER Site 2	WATER Site 1	SOIL Site 1	No. of SAMPLES	QC[b]	TOTAL SAMPLES
Petroleum Hydrocarbons	E418.1	4	4	4	1		14[a]	2	16
Purgeable Halocarbons	E601	4	4	4	1		14[a]	2	23[c]
Purgeable Aromatics	E602	4	4	4	1		14[a]	2	23[c]
Pesticides	E608	--	--	--	1		2[a]	1	3[c]
	SW3550/SW8080	--	--	--	--	16	16	1	27[c]
Moisture Determination		--	--	--	--	16	16	2	18
Total Dissolved Solids (TSD)	E160.1	4	4	4	1		13[a]	2	15
Total Nitrogen	Auto Analyzer	--	4	--	--		5[a]	1	6
Lead	E239.2 (or method of standard additions)[d]	4	4	4	1		14[a]	2	16
Arsenic	E206.2	4	--	4	--		9[a]	1	9

TABLE 1-1 (Continued)

ANALYTICAL PROGRAM

PARAMETER	METHOD EXTRACTION/ ANALYSIS	WATER Site 3	WATER Site 32	WATER Site 2	WATER Site 1	SOIL Site 1	No. of SAMPLES	QC[b]	TOTAL SAMPLES
Cadmium	E200.7	4	--	4	--		9[a]	1	9
Chromium	E200.7	4	--	4	--		9[a]	1	9
Mercury	E245.1	4	--	4	--		9[a]	1	9
Silver	E200.7	4	--	4	--		9[a]	1	9
Bentonite (Drilling Fluid Additive)	EP TOX	--	--	--	--		3	0	3

The methods cited in the analysis protocols come from the following sources:

"E" Methods (Water Only)
: E100 through E500 Methods
Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020 (USEPA, 1983)

E600 Series Methods
Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
USEPA
Federal Register, VOL 49, No. 209, 26 Oct 1984

"SW" Methods (Water & Soils)
: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition (USEPA, 1984)

TABLE 1-1 (Continued)

ANALYTICAL PROGRAM

[a] Includes one additional sample for analysis for drilling fluid additive as specified in SOW pg 2. C.1.f.

[b] QC field samples include duplicates, trip blanks and rinse (field) blanks.

[c] Total number of samples include second-column confirmation on 50% of samples (to include field QC samples).

[d] If a matrix effect is encountered, the Method of Standard Additions will be employed.

1.2 INSTALLATION DESCRIPTION AND HISTORY

1.2.1 Brief History of Eielson AFB and Waste Disposal Operations

Eielson AFB was orginally a satellite installation of Ladd Field (now Fort Wainwright, a U.S. Army installation) and was known as Mile 26, as it is located at Mile 26 of the Richardson Highway. Initial construction commenced in 1943, and the original base was completed in 1944. The base was constructed to handle lend-lease aircraft transfers to the USSR because Ladd Field's runway was too short for some of the aircraft and the volume of aircraft to be transferred overwhelmed the facilities there.

At the end of World War II, the field was deactivated, but it was reopened in 1946 as a future strategic base. The majority of the base facilities, including a larger, longer runway, were constructed in the period from 1947 to 1954. The base was officially named Eielson AFB in February 1948. During the 1950s, the base was used jointly by the U.S. Air Force and the U.S. Army.

The host organization at Eielson AFB is the 343rd Composite Wing of the Alaskan Air Command, formerly the 5010th Combat Support Group.

The industrial wastes generated on Eielson AFB prior to 1950 were insignificant. From about 1950 to 1972, wastes generated at Eielson AFB were disposed of by road oiling, burning in fire department training exercises, disposal in on-base landfills, or discharge to the sanitary sewer. From 1972 to 1978, industrial wastes were used for road oiling, placed in the landfill, or transferred to the Defense Property Disposal Office (DPDO) located at Fort Wainwright for salvage. Some solvents and most aircraft cleaning compounds were discharged to the sanitary sewer. JP-4 fuel with less than 10 percent contaminants was mixed with clean JP-4 and burned in fire training exercises or salvaged by DPDO. Since 1978, all wastes have been disposed of by DPDO, except up to 5,000 gallons per year of waste oils for road oiling, JP-4 with less than 10 percent contaminants for fire training exercises, and aircraft cleaning compounds, which are discharged to the sanitary sewer (CH2M Hill, 1982).

1.2.2 Physical Geography

Eielson AFB is located in the Tanana River Valley in interior Alaska, approximately 23 miles southeast of the city of Fairbanks. The base encompasses approximately 19,790 acres and is isolated from major urban areas. Land surface elevations range from 525 feet to as high as 1,125

feet MSL, although the developed portion of the base lies between 525 and 550 feet MSL.

The base is located on the geological floodplain of the Tanana River, approximately 2 miles east of the river. The Tanana-Kuskokwim Lowland, on which the Tanana River flows, is a smooth glaciofluvial outwash plain occuring at the foot of the Alaska Range, which lies approximately 100 miles south of Eielson AFB. A portion of the base lies on the Yukon-Tanana Upland to the east, an area characterized by rounded, even-topped ridges with gentle side slopes and broad undulating divides with flat-topped spurs. All regional drainage is toward the Tanana River and, hence, northwest into the Yukon River.

1.2.3 Regional Geology and Hydrogeology

The Tanana-Kuskokwim Lowland is a broad glaciofluvial outwash plain confined on the south by the Alaska Range and on the north by the Yukon-Tanana Upland. Bedrock is exposed in the upland and consists predominantly of Precambrian metamorphic schist, the quartz-mica Birch Creek Schist, with some Mesozoic intrusives. The schist is the regional basement rock, the surface of which is characteristically uneven and weathered to varying depths.

The regional consolidated deposits are overlain by substantial accumulations of unconsolidated Quaternary fluvial and glaciofluvial sediments shed from the rising Alaska Range. A thin layer of sandy loam overlies a thick sequence of sand and gravel. Unconsolidated sediments are approximately 200 to 300 feet thick under Eielson AFB.

In soils near main streams, permafrost (ground that has been frozen for 2 or more consecutive years) is generally absent. Away from the streams, soils are fine-grained and have shallow permafrost. Deeper sediments are unfrozen due to the presence of large quantities of ground water.

Ground water occurs as a water table aquifer under Eielson AFB. The water level is approximately 5 feet below the ground surface at an elevation of approximately 535 feet MSL. The regional hydraulic gradient is probably close to the slope of the ground surface, approximately 4 to 6 feet/mile, which results in relatively slow movement of ground water in the area; the direction of regional ground water flow is north-northwest. The aquifer is recharged by the Tanana River and its tributaries, and by infiltration of rainfall and snowmelt (CH2M Hill, 1982).

Past stream deposition governs the availability of ground water at Eielson AFB with the central portion of main stream channels being quite permeable. Most of the developed portion of the base is located in an area of high ground water availability.

1.2.4 General Hydrogeology

Eielson AFB is located over the shallow aquifer recognized in the vicinity, and the base receives its water supply from wells drilled into this aquifer (Plate 1). The wells are from 4 to 20 inches in diameter and from 80 to 250 feet deep. They are typically screened and gravel packed with specific capacities in the range of 50 to 400 gpm/foot of drawdown.

The major characteristics of the aquifer can be summarized as follows:

Lithology: sand and gravel
Depth of occurrence: 5 to 300 feet
Permeability: 1.0x10-1 cm/sec (estimated)
Yield Range: 6 to 3,000 gpm

The base water supply wells yield 1,000 to 2,000 gpm. The aquifer at Eielson AFB is approximately 250 feet thick and likely extends through the unconsolidated materials into the bedrock (Birch Creek Schist). Water quality is good except for high iron in some wells. The aquifer is limited in areal extent to the broad valley of the Tanana River Basin; at Eielson AFB, this valley is approximately 45 to 50 miles wide (CH2M Hill, 1982). Since the developed portion of the base is close to the Tanana River and local streams, there is little permafrost underlying the area. In fact, there are few impeding factors to slow the downward percolation of water or contaminants to the aquifer. There are no extensive silt or clay layers; the low silt and clay content of the sediments results in low adsorption. Contaminants could be expected to reach the water table quickly and to migrate downgradient with ground water flow.

1.2.5 Locations of Wells On and Off Base

Eielson AFB derives its water supply from three primary water supply wells and two emergency wells. Two other large capacity wells not connected to the main water supply system provide water for the power plant. One well supplies water for fire protection and is not connected to the main supply system. Eight low-capacity wells supply water to remote sites not connected to the main water supply system. There are ten abandoned or

decommissioned wells on the base. The well locations are provided on Plate 1, and Table 2 lists their construction data. No off-base well locations have been identified at this time, although it is certain that private water supply wells are located in the community of Moose Creek, approximately 1/4 to 1/2 mile north-northwest of the installation boundaries and downgradient of on-site pollutants. No well logs are available for Moose Creek.

1.2.6 Historic Ground Water Problems

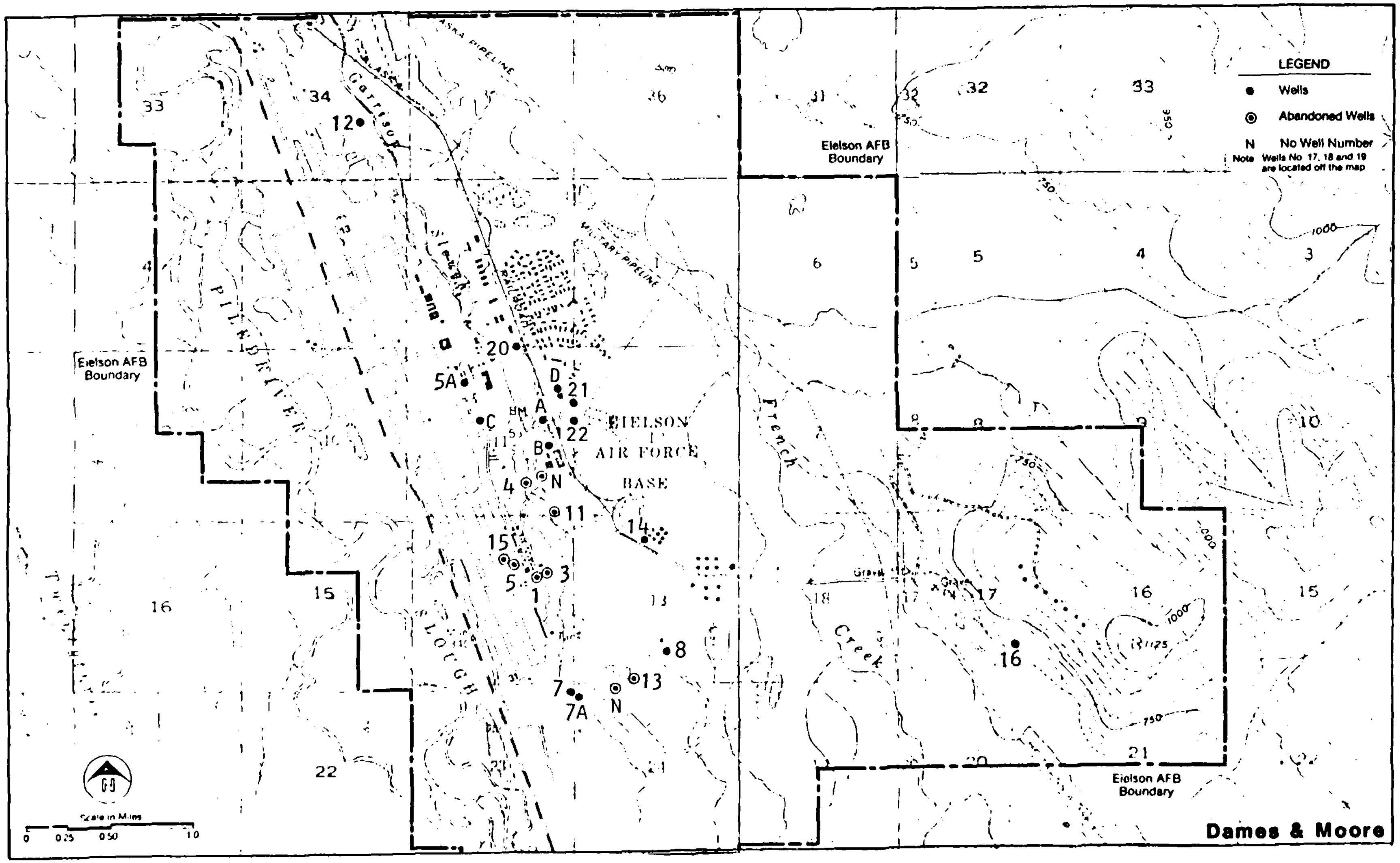
Although water quality from most wells penetrating the aquifer underlying Eielson AFB has generally been good with the exception of high iron content, there appear to be water quality problems at the base. Water from Well B has been found to contain benzene and lead, both constituents of fuel (ADEC, 1983; USAF, 1983). Further evidence of a ground water contamination problems includes the following:

- An oil sheen (hydrocarbon layer) on POL Lake (Petroleum, Oil, and Lubricants) during the summer and spring since at least 1979;
- An oil sheen on Garrison Slough in 1975;
- A hydrocarbon layer, primarily diesel fuel, on the water table in test holes near Facility 3224 (an oil/water separator operated at this site from 1975 to 1980);
- A hydrocarbon layer on the water table found during construction, in the mid-1970s, near the old boiler plant; and
- A hydrocarbon layer on the water table found in test holes drilled in 1972 within the refueling loop (CH2M Hill, 1982).

Indirect evidence of ground water contamination at the base includes several sites of POL saturated ground surfaces and vegetative distress. Any POL that was spilled on the ground at the base has very likely reached the ground water because the soils are very permeable and the water table is shallow. The potential for contamination is high.

1.3 DESCRIPTION AND HISTORY OF INDIVIDUAL SITES

CH2M Hill (1982) identified 43 sites within Eielson AFB where potentially hazardous materials were generated, disposed of, or used in some activity. These sites were assessed during the Phase I investigation



SOURCE; CH2MHILL (1982), ADAPTED FROM EIELSON AIR FORCE BASE WATER SUPPLY SYSTEM MASTER PLAN.

WATER WELL LOCATIONS, EIELSON AIR FORCE BASE

PLATE 1

TABLE 2

CONSTRUCTION DETAILS OF WATER WELLS AT EIELSON AFB

WELL NUMBER	LOCATION	DEPTH (ft)	CASING SIZE (inches)	FLOW (gpm)	REMARKS
A	Building No. 3408	96	12	1000	Main system
B	Building No. 3430	96	12	1000	Main system
C	Building No. 1201	96	12	1000	Main system, emergency only
D	Building No. 6204	96	18	2000	Main system
1	Building No. 4355	96	8	80 - 250	Pumps removed, line cut, abandoned
2	N223,800-E388,200	96	8	80 - 250	Pumps removed, line cut and plugged
3	N223,900-E388,600	96	8	80 - 250	Pumps removed, line cut and plugged
4	N227,300-E387,900	96	8	80 - 250	Abandoned
5	Building No. 1225	96	4	80 - 250	Pump removed
5A	Building No. 1164	96	8	490	Main system, automatic emergency only
7	Building No. 1301	96	12	1000	Fire pump not connected to main
7A	Building No. 1301	96	6	150	Secondary main system
8	Building No. 1307	90	4	10	
9	N226,000-E388,400	--	--	--	Abandoned
11	N226,600-E389,300	--	--	--	Abandoned
12	Building No. 2318	96	8	150	Sewage treatment plant
13	Building No. 1317	90	4	6.67	Abandoned
14	Building No. 6224	96	4	6.67	
15	Building No. 1216	90	4	6.67	Weather site, abandoned
16	Building No. 6395	150	4	6.67	Ski lodge
17	Building No. 500	96	8	85	Transmitter site, abandoned
18	Building No. 6151	250	6	150	Engineer Hill
19	Building No. 2030	140	4	8	Birch Lake
20	Building No. 3351	80	6	120	
21	Building No. 6200	112	20	3000	Water supply - power plant
22	Building No. 6201	118	20	3000	Water supply - power plant

Source: Master Plan, Water Supply System, Eielson AFB, updated September 30, 1981.

using the Hazard Assessment Rating Methodology (HARM). This rating procedure utilizes site characteristics, waste characteristics, the potential for contaminant migration, and waste management practices to identify sites warranting follow-up action. By that rating system, 17 sites were assessed to have the most significant potential for environmental impact and were judged to warrant further investigation. Under the scope of work issued to Dames & Moore in June 1984 under Contract F33615-83-D-4002, Order 0020, 17 sites received Phase II, Stage 1 investigation. However, Sites 10, 11, 13-20, 36, 37, and 41 from the fuel saturated area and Site 3 from the current base landfill will be investigated in the Phase IV study. The remaining 3 sites to be investigated in this Phase II investigation are as follows:

- Sewage Treatment Plant Spill Ponds: Site 32;
- Old Base Landfill: Site 2; and
- Original Base Landfill: Site 1.

These sites are shown on Plates 2-4 and are described below.

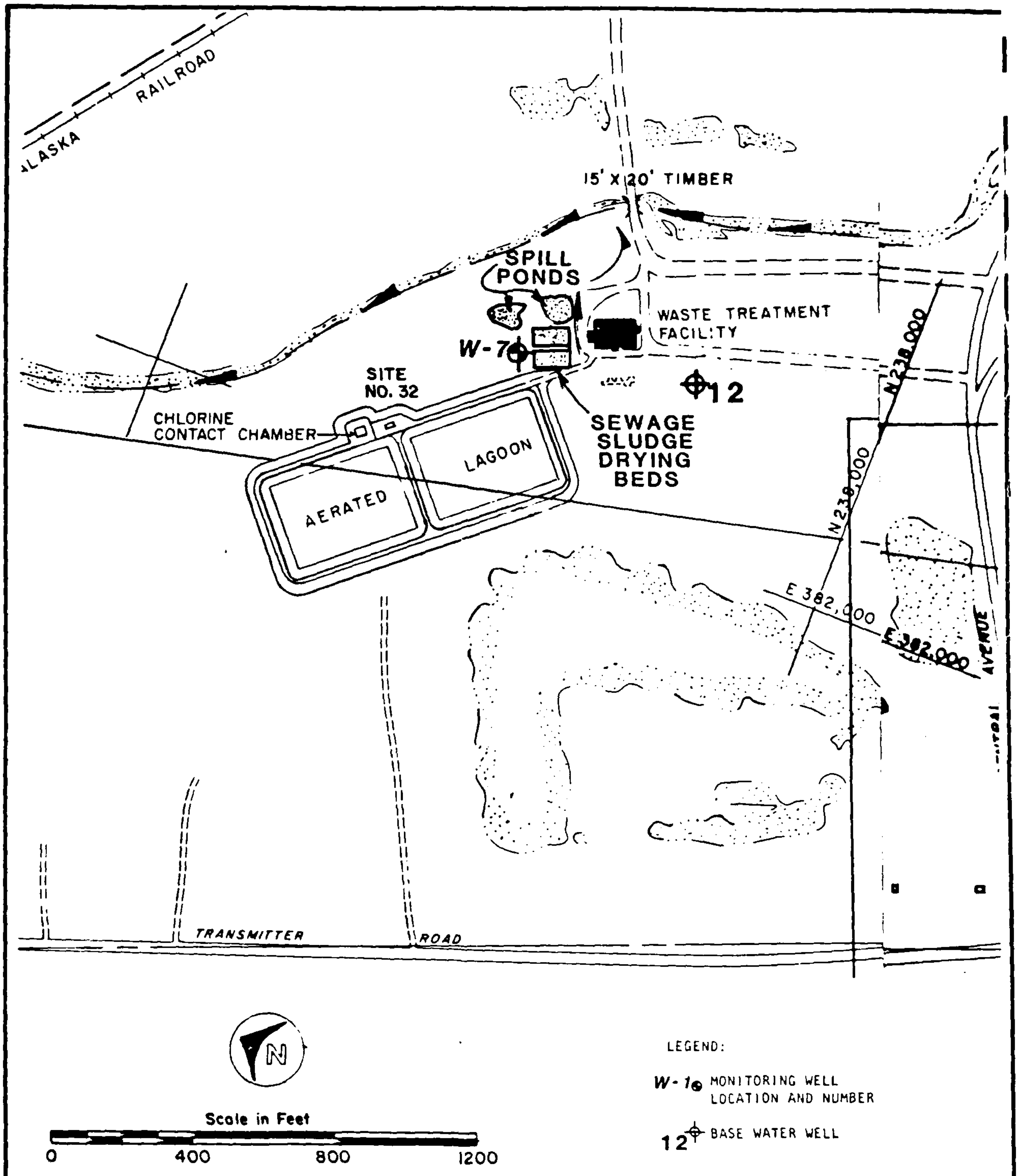
1.3.1 Sewage Treatment Plant Spill Ponds: Site 32

Two unlined pits adjacent to the sewage treatment plant have been used intermittently since 1970 to contain wastes bypassed around the plant that could cause a plant upset. Spills, primarily POL products, were diverted to the pits.

One monitoring well, W-7, was installed to a depth of 24 feet at the location shown on Plate 2. It is located generally downgradient of the spill ponds and sewage sludge drying containments.

The subsurface materials encountered at this site were primarily sand with lesser amounts of gravel and silt (Dames & Moore, 1986). Water was encountered at a depth of 9.0 feet on 12 July 1984. Soil samples were 7.1 percent moisture at 10 feet and 13 percent moisture at 15 feet. Explosimeter and HNU photoionization meter readings were low at the borehole location.

TOX and oil and grease levels were elevated at well W-7, indicating ground water contamination. Lead, phenols, and PCBs were below detection limits, but specific conductance, at 519 μmhos/cm, was the highest of the 10 wells measured.



SITE 32, SEWAGE TREATMENT PLANT
AND MONITORING WELL W-7

SOURCE: ADAPTED FROM MASTER PLAN LIQUID FUEL SYSTEM-EIELSON AIR FORCE BASE, DRG G-7 SHEET 1 OF 3 (1974).

Dames & Moore

PLATE 2

No PCBs were detected in the soil samples from W-7, and oil and grease levels were very low.

The ground water analyses from W-7 indicate water quality is degraded at the sewage treatment plant. TOC, TOX, specific conductance, and oil and grease were elevated at this site. The proximity of W-7 to Base Well 12 suggests that this water supply well may also be contaminated. Flow directions indicate off-base water supply wells, especially in the community of Moose Creek, could also be affected by leachate from this site.

1.3.2 Old Base Landfill: Site 2

This was the site of the base sanitary landfill from 1960 to 1967. Base refuse was burned at this site until about 1964, when burning was halted. After landfilling operations ceased in 1967, a cover of fly ash from the Central Heating and Power Plant was placed on the site. Hazardous materials, including waste oils, spent solvents, and paint residues and thinners, were reportedly disposed of at this site.

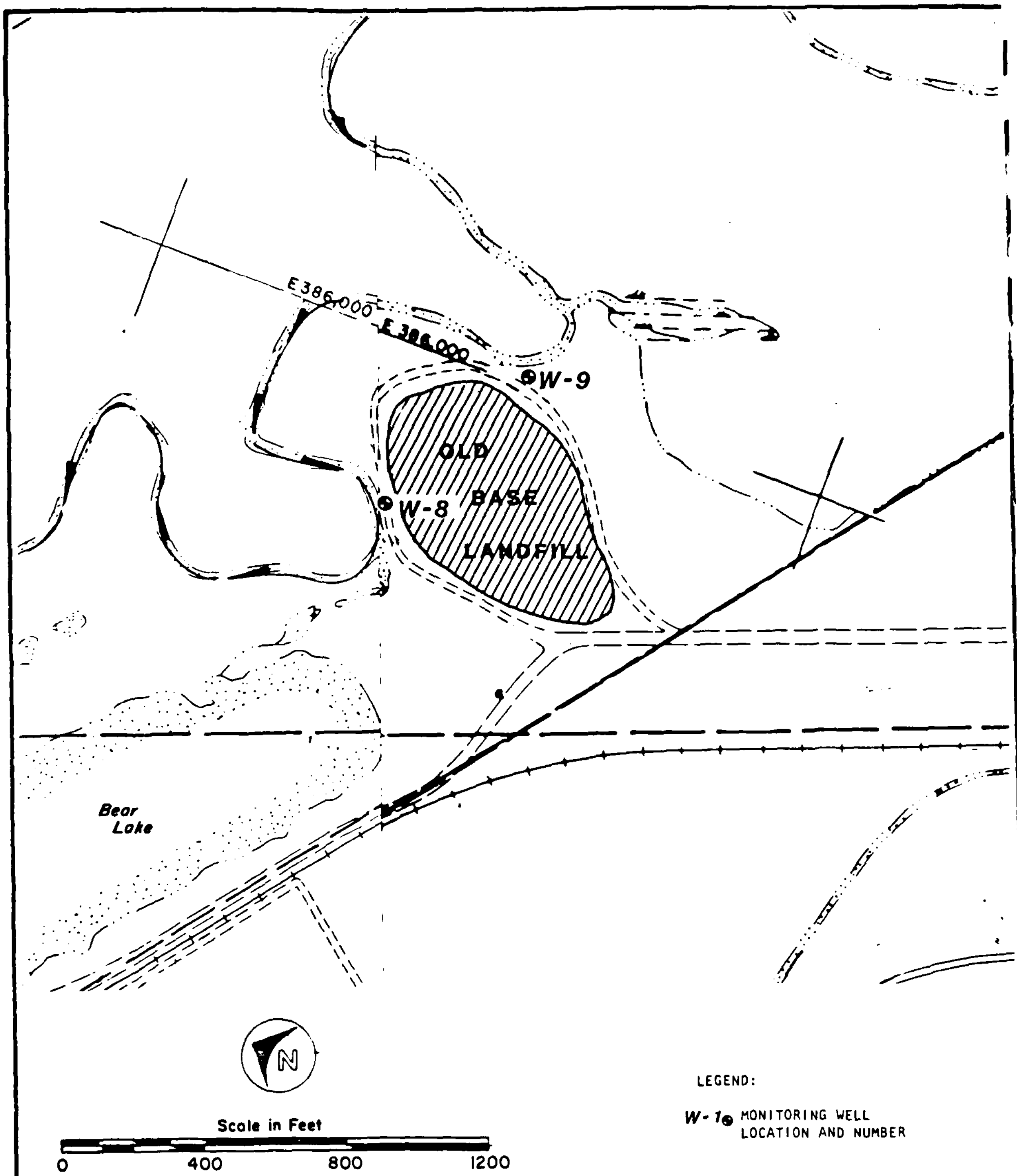
Two monitoring wells, W-8 and W-9, were completed to depths of 21 and 26 feet, respectively, at the locations shown on Plate 3. Both are generally downgradient of the landfill.

The subsurface materials at this site consist primarily of sand with lesser amounts of gravel and silt (Dames & Moore, 1986). Water was encountered at a depth of 6.0 feet in both boreholes on 11 and 12 July 1984. Analyzed soil samples ranged from 14 to 21 percent moisture. Explosimeter and HNU photoionization meter readings were low at the borehole locations.

The lead concentration detected in well W-8, 0.06 mg/L, exceeded the primary drinking water standard. TOX was elevated in this well at 100 µg/L. Oil and grease in W-8 and W-9 was low at 1.2 and 1.8 mg/L, respectively. Phenols and PCBs were below detection limits in both wells. TOX was elevated in W-9 at 110 µg/L. Specific conductance and pH were near expected background levels.

Soil samples from W-8 and W-9 had no detectable PCBs and very low oil and grease.

The primary drinking water standard for lead was exceeded at this inactive base landfill in well W-8. The elevated TOC and TOX in this well further indicate water quality degradation at this inactive base landfill.



SITE 2, OLD BASE LANDFILL, AND
MONITORING WELLS W-8 AND W-9

SOURCE; ADAPTED FROM MASTER PLAN LIQUID FUEL
SYSTEM-EIELSON AIR FORCE BASE, DRG
G-7 SHEET 1 OF 3 AND SHEET 2 OF 3 (1974).

Dames & Moore

PLATE 3

No base water supply wells are downgradient from this site, but it is possible that off-base wells, especially in Moose Creek, could be affected by the contamination here.

1.3.3 Original Base Landfill: Site 1

This was the main base landfill from about 1950 to 1960. At present, vegetation on the site has regrown in the form of a low ground cover and alder trees. Hazardous materials, including waste oils, spent solvents, and paint residues and thinners, were reportedly disposed of at this site (CH2M Hill, 1982). Burning was not conducted.

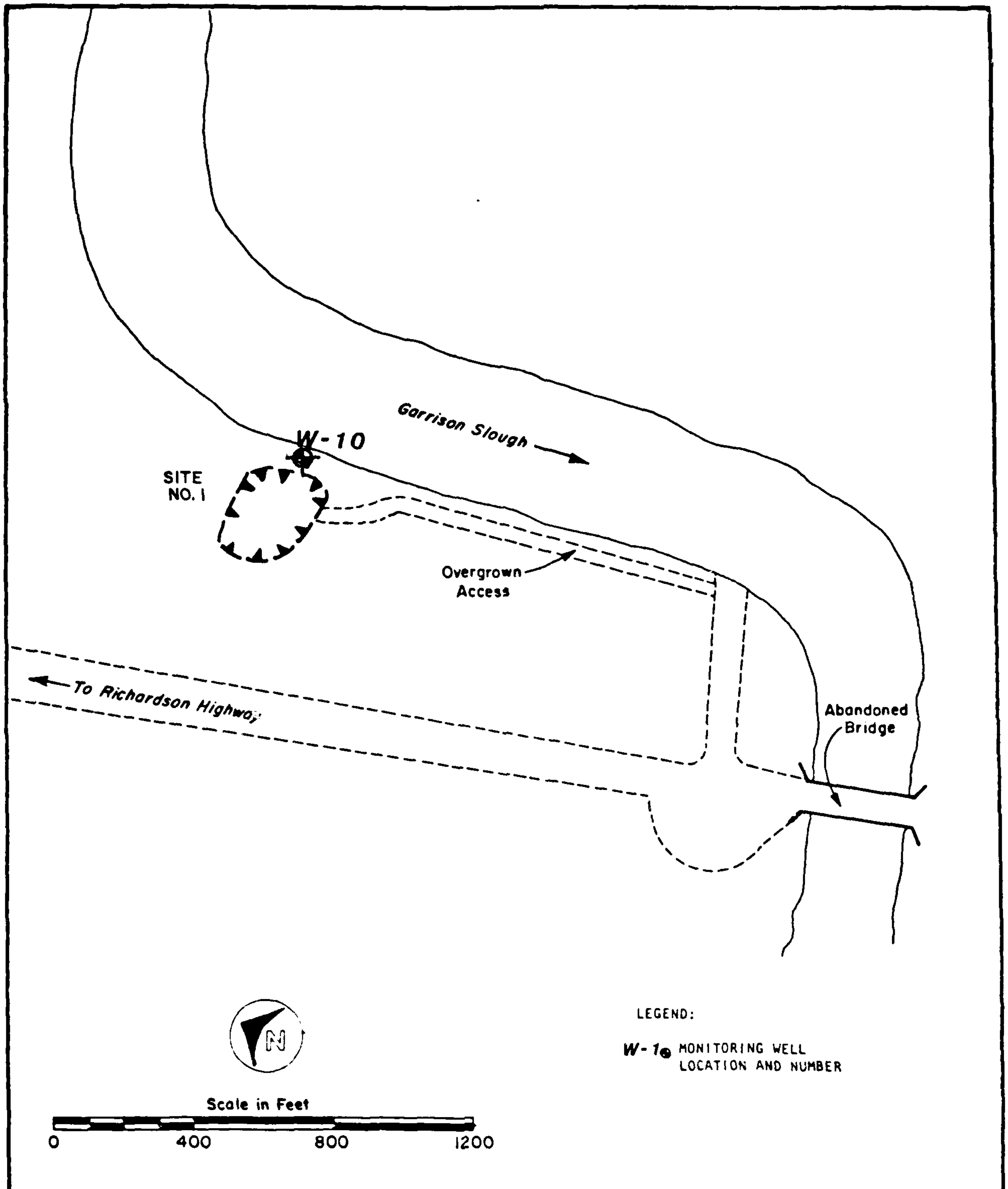
One monitoring well, W-10, was completed to a depth of 25 feet at the location of the landfill that was used from 1950 to 1960. The well is located near the downgradient edge of the landfill (Plate 4). It was not possible to determine the exact limits of the original landfill, but, based on the materials encountered during drilling, it appears that the well was installed in undisturbed material.

The subsurface materials encountered at this site consist primarily of sand with lesser amounts of gravel and silt (Dames & Moore, 1986). Water was encountered at a depth of 9.0 feet on 13 July 1984. Moisture in analyzed soil samples ranged from 3.1 percent at the surface to 14 percent at 20 feet. Explosimeter and HNU photoionization meter readings were low at the borehole location.

Results of water quality analyses in well W-10 indicate very little contamination. TOC was very low, and phenols and PCBs were below detection limits. TOX, lead, and oil and grease were found at levels of 89 μg/L, 0.02 mg/L, and 2.0 mg/L, respectively. Specific conductance and pH were near assumed background levels.

Soils analyses found no detectable PCBs in W-10 and very little oil and grease. Aldrin, dieldrin, chlordane, endrin, endrin aldehyde, heptachlor, lindane, and DDD were also below detection limits in W-10 soils. The trace quantities of DDT and its degradation product, DDE, were detected on the surface and at 5 feet; they were below detection limits at 10, 15, and 20 feet. The areal extent of this pesticide contamination cannot be determined from one boring.

No primary drinking water standards were exceeded in well W-10 at this inactive base landfill. Further, overall water quality results were generally good at this site. There has been, however, some contamination



SITE 1, ORIGINAL BASE LANDFILL, AND
MONITORING WELL W-10

Dames & Moore

PLATE 4

of the soil at this site with the pesticide DDT. This pesticide was detected on the surface and at 5 feet but not in deeper soil samples from W-10. This parameter was not analyzed for in the water in W-10, but since the water table is shallow in this area, the pesticide may have migrated into the ground water. Further, since the site is within the floodplain of Piledriver Slough, the potential for contaminant migration from this site is high. The risk to human health by water supply contamination is probably low from this site, but detailed information on ground water flow directions is needed to verify this assumption.

2.0 SITE INVESTIGATION SUMMARY

2.1 OVERALL FACILITY

The recommended program addresses three of the original 17 sites evaluated under the Phase II, Stage 1 investigation. These sites (32, 2, and 1) will be investigated under Phase II, Stage 2 by the addition of eight new monitoring wells and four soil borings. Also, electromagnetic mapping (EM) surveys will be conducted at Site 32 to determine the areal extent of any contaminated plume present. Investigation of Sites 10, 11, 13 through 20, 36, 37, and 41 (the fuel saturated area) and Site 3 (current base landfill) will be conducted as a Phase IV action and will not be addressed in this TOP.

2.2 INVESTIGATION OF INDIVIDUAL SITES

2.2.1 Sewage Treatment Plant Spill Ponds: Site 32

As indicated by the Phase II, Stage 1 investigation, the shallow water table (9 feet below ground surface) and high specific conductance (519 μmhos/cm) at well W-7 indicate that an EM survey will be useful for determining the areal extent of any plume that may be present at Site 32. A survey will be conducted downgradient of this site. A monitoring well will be installed to a depth of 30 feet in the area of highest conductivities as indicated by the survey. The screen will extend from 2 feet above the water table to the bottom of the well. One additional downgradient and one upgradient well will also be installed to maximum depths of 30 feet. Screening for these wells will extend from 2 feet above the water table to the bottom of the well.

The upgradient well will be installed by advancing casing so that a slug test can be performed. This will allow estimation of the hydraulic conductivity of the surficial aquifer.

One ground water sample from each well at the site, totaling four samples, will be analyzed for volatile organics (E601 and 602), lead, nitrates, TDS, and petroleum hydrocarbons. Nitrates are included because they are commonly found leaching from sewage lagoons.

2.2.2 Old (1960-1967) Base Landfill: Site 2

The Phase II, Stage 1 investigation indicated the presence of TOX, lead, and oil and grease. To confirm the contamination suggested by these

indicator parameters, two new monitoring wells will be installed, one upgradient of the site and one downgradient. The new downgradient well will be placed further downgradient than existing wells W-8 and W-9, since this site potentially impacts off-base water supplies. Each new well will be installed to a maximum of 30 feet and screened from 2 feet above the water table to the bottom of the well.

A ground water sample will be collected from each well at the site, totaling four samples. Each sample will be analyzed for volatile organics (E601 and 602), lead, arsenic, cadmium, chromium, mercury, silver, TDS, and petroleum hydrocarbons.

2.2.3 Original (1950-1960) Base Landfill: Site 1

During the Phase II, Stage 1 investigation, TOX, lead, and oil and grease were found in the ground water at Site 1 well W-10. To confirm this suspected ground water contamination, well W-10 will be resampled and analyses for volatile organics (E601 and 602), pesticides (E608), lead, TDS, and petroleum hydrocarbons will be conducted on a single sample.

In addition to ground water contamination found, DDT isomers were detected in soil at this site. Although DDT was not detected below a depth of 5 feet, indicating a relatively small volume of contaminated soil, the potential for migration is high because this site is in the floodplain of Piledriver Slough. To further investigate the extent of DDT soil contamination, four soil borings will be installed at compass points from 5 to 15 feet around well W-10. Each boring will be approximately 7 1/2 feet deep, and soil samples will be obtained at the surface and a 2 1/2-, 5-, and 7 1/2-foot depth intervals. All soil samples collected, totaling 16, will be analyzed for pesticides by Method SW8080.

3.0 FIELD SETUP

3.1 DETAILED WORK PLAN

3.1.1 Planning

- Contact USAFOEHL and AAC regarding meeting time and place.
- AAC contacts station POC to establish meeting specifics.
- Contact surveyor subcontractor regarding first survey start date.
- Contact drilling subcontractor regarding start date.
- Notify chemistry laboratory subcontractor to prepare bottles (cleaning, preservatives, etc.) and shipping containers.
- Make travel arrangements.
- Write Purchase Orders for PVC pipe/screen, drilling subcontractor, surveying subcontractor, chemistry subcontractor.
- Assemble and assess condition of all field equipment and supplies.
- Replace, repair, and supplement field equipment and supplies.
- Prepare Technical Operations Plan and submit to USAFOEHL.
- Brief field personnel on SOW; provide with TOP.
- Order health and safety equipment.

3.1.2 Mobilization

- Senior engineer mobilizes from Seattle; geophysicist mobilizes from Santa Barbara; field engineer mobilizes from Chicago.
- Survey crew mobilizes from Anchorage.
- Drilling subcontractor mobilizes from Anchorage.
- Field equipment is sent from California and Chicago.
- Field supplies are sent from California and Chicago. Remaining supplies are purchased in Alaska.
- Rent vehicles, locate housing.
- Field equipment, supplies, chemistry bottles, and shipping containers are stored in base temporary office area (SOW, p. 12, III.D.3).

- Decontamination area is tested (i.e., water pressure, electrical hookups, etc.) (SOW, p. 12, III.D.2).

- Dames & Moore personnel review existing engineering plans, drawings, diagrams, aerial photographs, etc. to evaluate sites to be investigated.

- PVC inspection at point of delivery.

3.1.3 On-Site Setup

- Senior engineer meets with AAC officials, base POC, and USAFOEHL Technical Monitor. Statement of work reviewed; boring locations for wells/borings are discussed and tentative locations are staked and numbered. Underground utilities are located and access problems resolved. Determine if any Phase II Stage 1 wells are to be abandoned.

- Air Force personnel brief Dames & Moore personnel, drilling and surveying crews on rules and regulations involved with working on base. Briefings may involve several meetings as mobilization of personnel is staggered (geophysics, first; survey, second; drill and sampling, third; final survey, fourth).

- USAF issues personnel identification badges and vehicle passes and/or entry permits.

- Orientation of survey crew to locate existing wells and surface water bodies (if any) to be included in preliminary survey.

- Preparation of preliminary water table map.

- Senior engineer briefs geophysicist on site specific conditions for Site 3 and Site 32. Discusses information gained from preliminary survey and construction of water table map. Geophysicist and Senior engineer establish grids for geophysical survey. USAF clearance on work granted.

- Orientation of drilling crew to site conditions, discussion of well/boring locations in light of preliminary water table map data.

- Finalizing well/boring locations with base POC. Air Force gives clearance and sign-off on digging permits.

- Senior engineer orients field engineer to site conditions and proposed boring locations.

- Discussion with base POC regarding handling procedures and 10% selection process of samples to be sent to OEHL, San Antonio.

- Commence drilling operations.

3.2 DAMES & MOORE HEALTH AND SAFETY PLAN

Project Name and Number: Phase II, Stage 2 Environmental Investigation
01016-261-07

Project Site Location: Eielson Air Force Base, Alaska

Project Manager: John S. Flickinger

Site Project Manager and On-Site Safety Officer: J. Michael Stanley

Plan Preparer: Michael W. Ander

Plan Reviewer: Leslie Birnbaum

Preparation Date: July 28, 1986

Plan Approvals:

Office Safety Coordinator

____
Michael W. Ander (date)

Managing Principal-in-Charge

____
Glenn D. Martin (date)

Project Manager

____
John S. Flickinger (date)

I. PURPOSE

The purpose of this Plan is to assign responsibilities, establish personnel protection standards, specify mandatory operating procedures, and provide for contingencies that may arise while operations are being conducted at the site.

II. APPLICABILITY

The provisions of the Plan are mandatory for all on-site Dames & Moore employees and subcontractors engaged in hazardous material management activities including but not limited to initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

III. RESPONSIBILITIES

A. Site Project Manager (SPM)

The SPM shall direct on-site investigation and operational efforts. At the site, the SPM, assisted by the On-Site Safety Officer, has the primary responsibility for:

1. Assuring that appropriate personnel protective equipment is available and properly utilized by all on-site personnel.

2. Assuring that personnel are aware of the provisions of this Plan, are instructed in the work practices necessary to ensure safety, and in planned procedures for dealing with emergencies.

3. Assuring that personnel are aware of the potential hazards associated with site operations (see Tables 1 and 2).

4. Monitoring the safety performance of all personnel to ensure that the required work practices are employed.

5. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.

6. Preparing any accident/incident reports (see attached Accident Report Form).

7. Assuring the completion of Plan Acceptance and Feedback forms attached herein.

B. Project Personnel

Project personnel involved in on-site investigations and operations are responsible for:

1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.

2. Implementing Project Health and Safety Plans, and reporting to the SPM for action any deviations from the anticipated conditions described in the Plan.

3. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the SPM.

IV. BACKGROUND

A. Site History

Based on the Installation Restoration Program, Phase II - Confirmation/ Quantification, Stage 1 investigation of Eielson Air Force Base, Alaska, there are five (5) areas that exhibit low levels of environmental contamination. This investigation has provided preliminary identification and quantification of contaminants at these five areas. The fuel saturated area and Site 3 will be detailed in Phase IV investigation. The remaining 3 areas are as described below.

1. Site 32

W-7 is the monitoring well installed at the sewage treatment plant spill ponds. TOX and oil and grease levels were elevated at this well, indicating ground water contamination. Lead, phenols, and PCBs were below detection limits, but specific conductance, at 519 μmhos/cm, was the highest of the 10 wells measured.

No PCBs were detected in the soil samples from W-7, and oil and grease levels were very low.

2. Site 2

Two monitoring wells, W-8 and W-9, were installed downgradient of an inactive base landfill. Lead in W-8, at 0.06 mg/L, exceeded the primary drinking water standard. TOX was elevated in this well at 100 μg/L. Oil and grease in W-8 and W-9 was low at 1.2 and 1.8 mg/L, respectively. Phenols and PCBs were below detection limits in both wells. TOX was elevated in W-9 at 110 μg/L. Specific conductance and pH were near expected background levels.

Soil samples from W-8 and W-9 had no detectable PCBs and very low oil and grease.

3. Site 1

W-10 was installed near an inactive base landfill. Results of water quality analyses in W-10 indicate very little contamination. TOC was very low, and phenols and PCBs were below detection limits. TOX, lead, and oil and grease were found at levels of 89 µg/L, 0.02 mg/L, and 2.0 mg/L, respectively. Specific conductance and pH were near assumed background levels.

Soils analyses found no detectable PCBs in W-10 and very little oil and grease. Aldrin, dieldrin, chlordane, endrin, endrin aldehyde, heptachlor, lindane, and DDD were also below detection limits in W-10 soils. The trace quantities of DDT and its degradation product, DDE, were detected on the surface and at 5 feet; they were below detection limits at 10, 15, and 20 feet. The areal extent of this pesticide contamination cannot be determined from one boring.

B. Dames & Moore Activity

Dames & Moore will be conducting the following activities at Eilson Air Force Base:

1. Site 32 - Sewage Treatment Plant Spill Ponds

   a. Conduct an EM survey downgradient of the site to determine the areal extent of any contaminant plume.

   b. Based upon the results of the EM survey, emplace one upgradient and two downgradient wells at the site. Each well is anticipated to be approximately 30 feet deep.

   c. Perform a slug test on the upgradient well to determine the hydraulic conductivity of the surficial aquifer.

   d. Obtain one ground water sample from each well at the site -- well W-7 (existing) and the three new wells. Analyze each sample (4 total) for volatile organics (E601 and 602), lead, total nitrogen, TDS, and petroleum hydrocarbons.

2. Site 2 - Old (1960-1967) Base Landfill

   a. Emplace one monitor well upgradient of the site and one well downgradient. The downgradient well shall be further downgradient that existing wells W-8 and W-9. Each well shall be approximately 20 feet deep.

   b. Obtain one ground water sample from each well at the site -- wells W-8 and W-9 and the two new wells.

c. Analyze each sample (4 total) for volatile organics (E601 and 602), lead, arsenic, cadmium, chromium, mercury, silver, TDS, and petroleum hydrocarbons.

3. Site 1 - Old (1950-1960) Base Landfill

a. Resample well W-10. Analyze the sample for volatile organics (E601 and 602), pesticides (E608), lead, TDS, and petroleum hydrocarbons.

Perform a soil boring program at the sites by installing four borings at compass points from 5 to 15 feet around well W-10. Each boring shall be approximately 7 1/2 feet deep. Obtain soil samples from each boring at the surface and at 2 1/2, 5, and 7 1/2 feet. Analyze the samples (16 total) for pesticides (SW8080).

C. Suspected Hazards

Suspected hazards are presented in as much detail as is currently available. These are POL (waste petroleum, oils, and solvents) products, JP-4 fuel, AVGAS, MOGAS, unknown halogenated compounds, and DDT and its degradation products.

V. EMERGENCY CONTACTS AND PROCEDURES

A. General

Should any situation or unplanned occurrence require outside or support services, the appropriate contact from the following list should be made:

Agency	Person to Contact		Telephone
D&M Site Project Manager	J. M. Stanley	(office) (home)	907/562-3366
D&M Industrial Hygiene and Safety Director	L. Birnbaum	(office) (home)	914/735-1200 914/783-0026
Police	Base Security		907/377-3133
Fire	Dispatcher		907/377-4156
Ambulance	Base Clinic		907/377-2296
Hospital	Base Clinic		907/377-2296
Command Post			907/377-1500

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on scene.

- A condition is discovered that suggests the existence of a situation more hazarious than anticipated.

B. The following emergency procedures should be followed:

1. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on scene, the entire field crew should immediately halt work and act according to the instructions provided by the Site Project Manager.

2. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team and reevaluation of the hazard and the level of protection required.

3. In the event that an accident occurs, the SPM is to complete an Accident Report Form for submittal to the MPIC of the office, with a copy to the Health and Safety Program Office. The MPIC should assure that follow-up action is taken to correct the situation that caused the accident.

C. Monitoring Methods, Action Levels, and Protective Measures

Methods for monitoring for suspected contaminants, action levels, and protective measures to be used for various contaminant concentration levels are presented in Table 1.

D. Protective Equipment Required for On-Site Activities

The protective equipment required may vary, depending on the concentrations and dispersion of contaminants encountered during each phase of the work. Table 2 specifies protective equipment required for each on-site activity.

TABLE 1

HAZARD MONITORING METHOD, ACTION LEVELS, AND PROTECTIVE MEASURES

Hazard	Monitoring Method	Action Level	Protective Measures
Explosive Atmosphere	Explosimeter or Combustible Gas Meter	< 10% LEL	Continue working
		10 - 15% LEL	Continue working with continuous monitoring
		> 25% LEL	EVACUATE the area -- EXPLOSION HAZARD

TABLE 2

PROTECTIVE EQUIPMENT REQUIRED FOR ON-SITE ACTIVITIES

Actvity/Location	Protective Equipment
During drilling and sampling	Half-face respirator with organic vapor cartridges*
	Nitrile gloves
	Rubber boots (steel toed)
	Hard hat with splash shield
	Disposable Tyvek coveralls

*If photoionization detector reading is greater than 300 ppm.

ATTACHMENT 1

PROTECTIVE EQUIPMENT

I. INTRODUCTION

When field investigation activities are conducted where atmospheric contamination is known or suspected to exist, where there is a potential for the generation of vapors or gases, or where direct contact with toxic substances may occur, equipment to protect personnel must be worn. Respirators are used to protect against inhalation and ingestion of atmospheric contaminants. Protective clothing is worn to protect against contact with and possible absorption of chemicals through the skin. In addition to protective clothing and respiratory protection, safe work practices must be followed. Good personal hygiene practice prevents ingestion of toxic materials.

Personnel equipment to be used has been divided into two categories commensurate with the degree of protection required, namely Levels C and D protection.

II. LEVELS OF PROTECTION

A. Level C

1. Personal Protective Equipment

   - Air-purifying respirator (MSHA/NIOSH approved)
   - Disposable chemical resistant coveralls
   - Gloves, outer, working gloves
   - Gloves, inner, chemical resistant
   - Boots, steel toe and shank
   - Hard hat (face shield)
   - Rubber boots, outer, chemical resistant (disposable)

2. Criteria for Selection

   a. Air concentrations of identified substances are such that reduction to at or below the substance's exposure limit is necessary and the concentration is within the service limit of the cartridge.

   b. Atmospheric contaminant concentrations do not exceed the Immediately Dangerous to.Life or Health (IDLH) levels.

   c. Contaminant exposure to unprotected areas (head and neck) are within skin exposure guidelines, or dermal hazards do not exist.

   d. Job functions have been determined not to require a higher level of protection.

B. Level D

1. Personal Protective Equipment

- Coveralls
- Boots/shoes, safety or chemical resistant, steel toe and shank
- Boots, outer (chemical resistant disposables)
- Hard hat (face shield)
- Gloves

2. Criteria for Selection

a. No indication of any atmospheric hazards.

b. Work function precludes dusting, splashes, immersion, or potential for exposure to any chemicals.

3. Guidance on Selection Criteria

a. Level D protection is primarily a work uniform and should not be worn in any area where the potential for contamination exists.

b. In situations where respiratory protection is not necessary, but site activities are needed, chemical resistant garments -- high quality or disposable -- must be worn.

III. RESPIRATORY PROTECTION

The following procedures should be used for respiratory protection:

A. Inspect all washers, diaphragms, and facepiece-to-face seal area for any tears, pinholes, deformation, or brittleness. Should any of these exist, use a different respirator.

B. Place the respirator on the face, tighten and use both a positive and a negative pressure test, prior to entering the site, to assure a proper fit. Checking for proper fit involves the following:

1. Negative Pressure Test

Close off the inlet opening of .the cartridge or the breathing tube by covering it with the palm of the hand or by replacing the tap seal. Gently inhale so that the facepiece collapses slightly, and hold the breath for 10 seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is satisfactory.

2. Positive Pressure Test

Remove the exhalation valve cover. Close off the exhalation valve with the palm of the hand. Exhale gently so that a slight positive pressure is built up in the facepiece. If no outward leakage of air is detected at the periphery of the facepiece, the face fit is satisfactory. (Note: With certain devices, removal of the exhaust valve cover is very difficult, making the test almost impossible to perform.)

ATTACHMENT 2

DAMES & MOORE STANDARD OPERATING PROCEDURES

WORK PRACTICES

1. Smoking, eating, drinking, and chewing tobacco are prohibited in the contaminated or potentially contaminated area.

2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surface (i.e., ground, etc.).

3. All field crew members should make use of their senses (all senses) to alert them to potentially dangerous situations (i.e., presence of strong and irritating or nauseating odors).

4. Prevent, to the extent possible, spillages. In the event that a spillage occurs, contain liquid if possible.

5. Prevent splashing of the contaminated materials.

6. Field crew members shall be familiar with the physical characteristics of investigations, including:

   - wind direction
   - accessibility to associates, equipment, vehicles
   - communication
   - hot zone (areas of known or suspected contamination)
   - site access
   - nearest water sources

7. The number of personnel and equipment in the contaminated area should be minimized consistent with site operations.

8. All wastes generated during D&M and/or subcontractor activities on site should be disposed of as directed by the Field Activity Leader.

HALF-FACE RESPIRATORS

Inspection Procedure

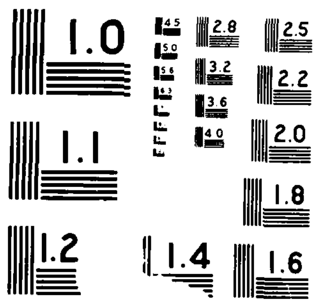
1. Look for breaks or tears in the headba[illegible] stretch to check the elasticity.

2. Make sure all headbands, fast[illegible] place and not bent.

AD-A193 106 INSTALLATION RESTORATION PROGRAM PHASE 2 CONFIRMATION/QUANTIFICATION STAGE 2(U) DAMES AND MOORE PARK RIDGE IL 03 APR 88 F33615-83-D-4002 4/4

UNCLASSIFIED F/G 24/4 NL

END
DATE
FILMED
7 88


1.0
1.1
1.2
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6

3. Check the facepiece for dirt, cracks, tears, or holes. The rubber should be flexible, not stiff.

4. Look at the shape of the facepiece for possible distortion that may occur if the respirator is not protected during storage.

5. Check the exhalation valve located near the chin between the cartridges by the following:

   - Unsnap the cover;

   - Lift the valve and inspect the seat and valve for cracks, tears, dirt, and distortion; and

   - Replace the cover. It should spin freely.

6. Check both inhalation valves (inside the cartridge holders). Look for same signs as above.

7. Check the yoke for cracks.

8. Make sure the cartridge holders are clean. Make sure the gaskets are in place and the threads are not worn. Also look for cracks and other damage.

9. Check the cartridges for dents or other damage, especially in the threaded part.

Donning Procedure

1. Screw the cartridge into the holder hand-tight so there is a good seal with the gasket in the bottom of the holder, but don't force it. If the cartridge won't go in easily, back it out and try again.

2. Always use cartridges made by the same manufacturer who made the respirator.

3. Place the facepiece over the bridge of your nose and swing the bottom in so that it rests against your chin.

4. Hold the respirator in place and fasten the top strap over the crown of your head.

5. Fit the respirator on your face and fasten the strap around your neck. Don't twist the straps. Use the metal slide to tighten or loosen the fit, but not too tight.

6. Test the fit by:

   - Lightly covering the exhalation valve with the palm of your hand. Exhale. If there is a leak, you will feel the air on your face.

- Covering the cartridges with the palms of your hands. Again, don't press too hard. Inhale. The facepiece should collapse against your face.

- If there is a leak with either test, adjust the headbands or reposition the facepiece and test until no leakage is detected.

Sanitizing Procedure

1. Remove all cartridges, plugs, or seals not affixed to their seats.

2. Remove elastic headbands.

3. Remove exhalation cover.

4. Remove speaking diaphragm or speaking diaphragm/exhalation valve assembly.

5. Remove inhalation valves.

6. Wash facepiece and breathing tube in cleaner/sanitizer powder mixed with warm water, preferably at 120° to 140°F. Wash components separately from the facemask, as necessary. Remove heavy soil from surfaces with a hand brush.

7. Remove all parts from the wash water and rinse twice in clean warm water.

8. Air dry parts in a designated clean area.

9. Wipe facepieces, valves, and seats with a damp lint-free cloth to remove any remaining soap or other foreign materials.

MONITORING EQUIPMENT INSTRUCTIONS

A. Combustible Gas Indicators (CGIs)/Explosimeters

In addition to the instructions found below, all CGIs should be calibrated prior to use, in an uncontaminated, fresh air environment. Furthermore, units incorporating an aspirator bulb or other air-drawing device should be checked for leaks in the following manner:

o Attach all hoses, probes, and other air-drawing devices to CGI.

o Place a finger over probe or hose end.

o Operate pump or squeeze aspirator bulb.

In a leak-free system, bulb remains collapsed or pump labors. In a leaking system, bulb regains its shape or pump does not labor.

1. MSA Explosimeter Combustible Gas Indicator

   a. Turn explosimeter on by lifting end of "on-off" bar on "rheostat" knob and rotating "rheostat" knob clockwise 1/4 turn.

   b. Flush instrument with fresh air by squeezing and releasing aspirator bulb about five times.

   c. Rotate "rheostat" knob until meter needle rests at zero (Avoid large clockwise rotation, which sends large current through filament, perhaps shortening its useful life.)

   d. To sample, place hose or probe end in atmosphere to be measured and operate aspirator bulb about five times.

   e. Read percent of lower explosive limit (LEL) as meter needle fluctuates from a steady-state level to a higher level each time the aspirator bulb is flexed. The steady-state reading indicates the "true" value.

   f. Turn explosimeter off by lifting end of "on-off" bar on "rheostat" knob and rotating it counterclockwise until it "clicks." "On-off" bar retracts into "rheostat" knob.

B. Photoionization Detector

1. Before attaching the probe, check the function switch on the control panel to make sure it is in the off position.

2. Attach the probe by plugging in the 12-pin plug to the interface on the readout module.

3. Turn the 6-position function switch to the battery check position. The needle on the meter should read within or above the green battery arc on the scale. If not, recharge the battery. If the red indicator comes on, the battery should be recharged.

4. Turn the function switch to any range setting. Look into the end of the probe briefly to see if the lamp is on. If it is on, it will give a purple glow. Do not stare into the probe for any length of time, as UV light can damage your eyes. The instrument is now ready for operation.

5. To zero the instrument, turn the function switch to the standby position and rotate the zero potentiometer until the meter reads zero. Clockwise rotation of the span pot produces a downscale deflection, while counterclockwise

rotation yields an upscale deflection. Note: No zero gas is needed, since this is an electronic zero adjustment. If the span adjustment setting is changed after the zero is set, the zero should be rechecked and adjusted, if necessary. Wait 15 to 20 seconds to ensure that the zero reading is stable. If necessary, readjust the zero.

6. Turn function switch to the 0-20, 0-200, or 0-2000 position.

7. Place probe in the atmosphere to be monitored. If the needle moves to the upper limit of the scale, change the function switch to the next position.

ENVIRONMENTAL SAMPLES

Environmental samples must be packaged and shipped according to the following procedure:

1. Packaging

   a. Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal bag.

   b. Place sample in a fiberboard container or metal picnic cooler that has been lined with a large polyethylene bag.

   c. Pack with enough noncombustible, absorbent, cushioning material to minimize the possibility of the container breaking.

   d. Seal large bag.

   e. Seal or close outside container.

   Environmental samples may also be packaged following the procedures outlined later for samples classified as "flammable liquids" or "flammable solids." Requirements for marking, labeling, and shipping papers do not apply.

2. Marking/Labeling

   Sample containers must have a completed sample identification tag, and the outside container must be marked "Environmental Sample." The appropriate side of the container must be marked "This End Up," and arrows should be drawn accordingly. No DOT marking and labeling is required.

3. Shipping Papers

   No DOT shipping papers are required.

4. Transportation

   There are no DOT restrictions of mode of transportation.

FORM #IHST-1

REVIEW RECEIPT

PROJECT HEALTH AND SAFETY PLAN

Instructions: This form is to be completed by each person to work on the site and returned to the Program Director-Industrial Hygiene and Safety.

Job No. 01016-261-07

Project: Phase II, Stage 2 Environmental Investigation
Eielson Air Force Base, Alaska

Rev. No. 0 Date: 07/12/84

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

____
Signed

____
Date

PLAN FEEDBACK FORM

Problems with plan requirements:

____

____

____

____

____

Unexpected situations encountered:

____

____

____

____

____

Recommendations for future revisions:

____

____

____

____

____

PLEASE RETURN TO THE FIRMWIDE HEALTH AND SAFETY OFFICE - WP

ACCIDENT REPORT FORM

<table>
<tr><td colspan="4">SUPERVISOR'S REPORT OF ACCIDENT</td><td colspan="2">DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS</td></tr>
<tr><td colspan="2">TO</td><td colspan="4">FROM

TELEPHONE (include area code)</td></tr>
<tr><td colspan="6">NAME OF INJURED OR ILL EMPLOYEE</td></tr>
<tr><td>DATE OF ACCIDENT</td><td>TIME OF ACCIDENT</td><td colspan="4">EXACT LOCATION OF ACCIDENT</td></tr>
<tr><td colspan="6">NARRATIVE DESCRIPTION OF ACCIDENT</td></tr>
<tr><td colspan="5">NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED</td><td>LOST TIME
YES ☐ NO ☐</td></tr>
<tr><td colspan="6">PROBABLE DISABILITY (check one)</td></tr>
<tr><td>FATAL
☐</td><td>LOST WORK DAY WITH __ DAYS AWAY FROM WORK
☐</td><td>LOST WORK DAY WITH __ DAYS OF RESTRICTED ACTIVITY
☐</td><td colspan="2">NO LOST WORK DAY
☐</td><td>FIRST AID ONLY
☐</td></tr>
<tr><td colspan="6">CORRECTIVE ACTION TAKEN BY REPORTING UNIT</td></tr>
<tr><td colspan="6">CORRECTIVE ACTION THAT REMAINS TO BE TAKEN (by whom and by when)</td></tr>
<tr><td colspan="3">NAME OF SUPERVISOR</td><td colspan="3">TITLE</td></tr>
<tr><td colspan="3">SIGNATURE</td><td colspan="3">DATE</td></tr>
</table>

3.3 SUBCONTRACTOR INFORMATION

3.3.1 Chemistry Subcontractor

UBTL, Inc.
520 Wakara Way
Salt Lake City, Utah 84108
Telephone: 801/584-3232

3.3.2 Surveying Subcontractor

Kean and Associates
6510 Homer Drive
Anchorage, Alaska 99518
Telephone: 907/349-6431

3.3.3 Drilling Subcontractor

Tester Drilling Services, Inc.
1601 East 84th Court, Suite 106
Anchorage, Alaska 99507
Telephone: 907/349-7214

4.0 CALIBRATION OF FIELD EQUIPMENT

All field equipment will be calibrated according to the manufacturers' specifications, as described below. The personnel assigned to take measurements in the field will assemble as much equipment as feasible in the laboratory prior to mobilization to the site. The personnel will become familiar with the calibration of all instruments, as outlined in the respective manuals, and will make all calibrations that can be made at that time. Pertinent sections of the respective manuals will be photocopied for reference in the field, and all equipment that will be necessary for field calibration, such as buffer solutions and calibration gases, will be assembled.

LIST OF FIELD EQUIPMENT

4.1 Electromagnetics Terrain Conductivity Meter
4.2 Magnetometer
4.3 Metal Locator
4.4 Hand Pump
4.5 Vacuum Pump
4.6 Water Filters
4.7 Total Organic Vapor Analyzer
4.8 Explosimeter
4.9 Conductivity Meter
4.10 pH Meter
4.11 Thermometer (Thermocouple)
4.12 Bailers
4.13 Decontamination Supplies
4.14 Respirators, Cartridges, and Filters
4.15 Locks

4.1 ELECTROMAGNETICS TERRAIN CONDUCTIVITY METER

The Geonics EM-31D is a one-man instrument consisting of a control unit and transmitter and receiver coils. The system permits measurements of terrain conductivity to be made without the need for direct earth coupling and to an effective depth of exploration of 20 feet. The EM-31D is equipped for output to a digital data logger. The instrument requires no field calibration or adjustment.

Verification of system repeatability is obtained by residing at a calibration station at the start, middle, and end of each survey day. Normally, readings should fall within a rage of 10%, however, changes in soil moisture content (e.g., following a prolonged period of rain) may effect the natural reading value.

4.2 MAGNETOMETER

The EDA OMNI proton precession magnetometer is a micro-processor based unit capable of reading total magnetic field intensity and vertical magnetic gradient. The OMNI IV consists of two parts; one is the reading/recording module and the other is the sensor. These are interconnected by cable.

Proper system operation is tested at the start of a field investigation and before each field day of recording in accordance with the procedures detailed in the Instrument Operations Manual. Using the "TEST" and "DUMP" modes the following tests are made:

- Total Field Test

- Error Calculation Test

- Software Diagnostics

In the course of the "Total Field Test", approximately 85% of the OMNI IV electronics is tested. As a result of this test, there is an 80% probability that the OMNI IV is operating satisfactorily. Further verification of system performance is obtained by comparing the TOTAL field intensity value obtained at the base station with published iso-intensity maps of the total intensity of the earth's magnetic field.

4.3 METAL LOCATOR

The Discovery Electronic TF-600 is a ground-reject metal locator capable of screening out spurious responses produced by metal litter and variations in soil conditions. The TF-600 requires that an instrument nulling procedure be followed to optimize survey results. This is accomplished at the start of a survey using the mode selector and two nulling controls present on the instrument panel following the procedures prescribed in the Instrument Operations Manual. Frequently, once set, the nulling controls need not be changed through the course of the entire

survey. As a standard practice, the nulling process is performed at the start of each survey day.

Systems performance is verified by passing the TF-600 over a visible metallic object and noting the tone response of the instrument.

4.4 HAND PUMP

A Brainard Kilman 1.7-inch hand pump will be used for well development and purging. This is a PVC pump with a 2.75-gpm pumping rate. An external power source is not required to operate this manual pump. The only calibration applicable for this type of equipment is an initial measurement of the length and internal diameter of the pump piping to confirm the stated volume capacity. Prior to use, the threads and check valve will be inspected to ensure a tight seal. The performance of the "O" ring seal will also be tested. During purging, the evacuated water will be placed in containers to determine the volume of water removed.

4.5 VACUUM PUMP

A Millipore vacuum pressure pump, Model XX60-000-000, will be used to pull water samples through a filter prior to metals analysis. No calibration is necessary for this piece of equipment. Performance level is monitored by two gauges, one on the suction and the other on the discharge side of the pump.

4.6 WATER FILTERS

QED Environmental Systems Sample Pro high capacity field filters will be used to filter sediments from water to be sampled for metals. The filter used will be a 0.45-micron filter, Model FF-8000. The filtered water sample will then be free of soil particles larger than 0.45 microns containing metals or minerals that could give false high readings of metals. No calibration is required for this type of equipment. the filters are commercially packaged to prevent contamination. the integrity of the package will be visually inspected prior to use.

4.7 TOTAL ORGANIC VAPOR ANALYZER

The analyzer used will be an HNU Model P1-101. The HNU is a quantitative instrument that measures the total concentration of numerous organic vapors in the air. The instrument is used primarily as a safety or screening device to determine the presence and concentration of organic

vapors. The HNU is battery operated and lightweight, making it very useful in actual field monitoring projects. The instrument is calibrated by introducing pressurized gas from a cylinder with a known organic concentration into the detector. Once the concentration has stabilized, the display of the instrument is adjusted to match the known concentration. A calibration of this type is performed prior to each usage of the instrument. If the output differs greatly from the known concentration, the initial procedure to remedy the problem is a thorough cleaning of the instrument. The cleaning process normally removes foreign materials that affect the calibration of the instrument. If this procedure does not remedy the problem, further troubleshooting is performed until the problem is resolved. If the problem cannot be resolved by Dames & Moore technicians, the instrument is returned to the manufacturer for repair.

4.8 EXPLOSIMETER

An MSA Model 2A explosimeter will be used to determine the presence of explosive gases or vapors in ambient air. The instrument is used primarily as a safety device to determine whether the atmosphere contains vapors or gases in sufficient quantities to be explosive. The explosimeter is calibrated by plumbing a small quantity of explosive gases into the instrument and comparing the instrument's output with the known gas concentration. This calibration is performed before each field use. The instrument is cleaned after each field assignment. All components are checked for proper working order and replaced as necessary.

4.9 CONDUCTIVITY METER

A YSI Model 33 S-C-T meter will be used to measure water conductivity. To calibrate, the meter is turned off and the level indicator is adjusted to zero on the readout face. Next, the meter switch is set to "red line" and the level indicator is adjusted to the red line marking on the readout face.

4.10 pH METER

An L.G. Nester Model 47 mini pH meter will be used to measure water pH. The meter has a gel-filled combination electrode so that no reference refilling is required. To calibrate, the electrode is first immersed in a 6.86 pH buffer and the "calibrate" knob is turned until the meter reads 6.86. The electrode is rinsed in distilled water and then immersed in 4.01 pH buffer. Next, the "temp" knob is turned so that the meter reads 4.01 and the span is then adjusted. However, the meter should be calibrated to

within 3 pH of the sample value. Therefore, for the zero to 10 pH range, the meter should be set to read 8.86 and 6.01 versus 6.86 and 4.01 in the calibration procedure. For pH readings in the 4 to 14 range, the meter must be set to read 4.86 and 2.01 in the calibration procedure.

4.11 THERMOMETER (THERMOCOUPLE)

A Fluke Model 80TK will be used to measure the temperature of gases and liquids. This device has a range of -50°C to 1000°C to an accuracy of $\pm$1.0°C. This instrument is calibrated by comparison with a Hewlett-Packard Model 2804A quartz thermometer standard. The calibration is performed by placing the standard's probe and the probe of the thermocouple in identical water baths. The output of the thermocouple is adjusted to correspond with the standard. The calibration is performed once a year but is more frequently checked with respect to other thermometers.

4.12 BAILERS

Teflon bottom discharge bailers manufactured by Timco Mfg., Inc., will be used for well sampling. The only calibration applicable for this type of equipment is an initial measurement of the length and internal diameter of the bailer to confirm the stated volume capacity. Prior to use, the threads will be inspected to ensure that connections are tight. The bailer will be inspected for scratches or dents that could also affect the integrity of the equipment. The operation of the discharge mechanism will be tested prior to use. The bailer will be packaged for transport to minimize the effects of jostling.

4.13 DECONTAMINATION SUPPLIES

All sampling equipment will be decontaminated prior to use and between samples to avoid cross-contamination. As specified in the Statement of Work, decontamination supplies will include methanol, laboratory-grade detergent, and distilled water. Certified grade methanol will be used to ensure high purity. Alconox laboratory-grade detergent (Fisher Scientific Company) will be used due to its low sudsing and low residue properties. The final rinsing of equipment will be done using commercially available distilled water. All decontamination supplies will be transported sealed in unbreakable containers. The containers will be visually inspected for leaks or contamination prior to each use.

4.14 RESPIRATORS, CARTRIDGES, AND FILTERS

Half mask, combination filter/cartridge respirators will be donned by sampling personnel when field situations warrant. The respirators will be fitted with GMA cartridges with Type F filters for removal of organic vapors, dusts, and mists. These are NIOSH (National Institute for Occupational Safety and Health) tested, and NIOSH and MSHA (Mine safety and Health Administration) approved. The GMA cartridge is approved for use in atmospheres containing at least 19.5 percent oxygen and less than 0.1 percent organic vapors by volume.

4.15 LOCKS

Good quality, reasonably priced padlocks will be placed on each monitor well to discourage tampering and vandalism. The locks will be purchased from a locksmith supplier and will be performance tested at the time of purchase and when placed on a well. As per Alaskan Air Command request, the locks will be keyed alike to avoid the possibility of confusion among keys.

5.0 PREVENTIVE MAINTENANCE OF FIELD EQUIPMENT

All field equipment will be maintained according to manufacturers' specifications, as discussed below. As described in Section IV, all equipment will be assembled in the laboratory, if feasible, for calibration prior to mobilization. At this time, the equipment will be checked to ensure that it is in proper working order, and any required maintenance will be performed. Tools and equipment that may be needed for field maintenance will be assembled, and pertinent sections of the manuals will be photocopied for reference in the field.

LIST OF FIELD EQUIPMENT REQUIRING PREVENTIVE MAINTENANCE

5.1 Electromagnetics Terrain Conductivity Meter
5.2 Magnetometer
5.3 Metal Locator
5.4 Hand Pump
5.5 Vacuum Pump
5.6 Total Organic Vapor Analyzer
5.7 Explosimeter
5.8 Conductivity Meter
5.9 pH Meter
5.10 Thermocouple
5.11 Bailers

5.1 ELECTROMAGNETICS TERRAIN CONDUCTIVITY METER

Field maintenance of the EM-31D and accessory logger consists of the following:

- Battery replacement when low power is indicated; and

- Inspection of the data logger interconnect cable and connector for visible evidence of damage.

Verification of stored data validity is obtained by period notation of instrument reading and data logger record number for comparison against the print-out of the record values following a data dump.

5.2 MAGNETOMETER

Field maintenance of the OMNI IV normally consist of the following tasks:

- Replacement of discharged battery pack with freshly charged battery pack when the battery descriptor indicates low power;

- Inspection of sensor cable and battery pack cable (for belt pack) and connectors for visible evidence of damage; and

- Checking the sensor bath fluid level for the presence of an adequate level of fluid as evidenced by a sloshing sound when the sensor is gently shaken.

5.3 METAL LOCATOR

Instrument field maintenance consists solely of battery replacement when the battery indicator meter shows low power.

5.4 HAND PUMP

The hand pump is packed and handled to minimize dents to the piping or damage to the pipe threads or check valve. When stored, the "O" rings should be kept in darkness to prevent deterioration so that a tight seal will be maintained when in use. When in use, it is important that the inner pump cylinder is not jammed down hard or pushed down into the sediment in the bottom of the well. This action has the potential to cause damage to the check valve, "O" ring seal assembly, and/or pump cylinder. A "holding dog" will be used to hold the pump assembly up in the well a safe distance (typically 2 feet) from the sediments at the bottom of the well.

5.5 VACUUM PUMP

The vacuum pump is packed and handled so as to prevent damage. The plug and cord are visually inspected prior to going into the field for defects that could cause a short. Electrical problems will be repaired before the pump is taken to the field. The pump bearings are kept lubricated. Seals are inspected and replaced when damaged or deteriorated. The pump is tested and repaired as necessary before it is taken to the field.

5.6 TOTAL ORGANIC VAPOR ANALYZER

The detector must be kept clean for accurate operation. Foreign materials can be rinsed or wiped off or blown out of the detector. The cord between the analyzer and the recorder should not be wound tightly, and will be visually inspected for integrity before going into the field. A new cord will be ordered from the manufacturer if problems are found. A battery check indicator is included on the equipment and will be checked prior to going into the field and prior to use. The batteries will be charged if found to be weak. The analyzer, probe, and meter are packed securely and handled so as to minimize the chance of damaging parts.

5.7 EXPLOSIMETER

This instrument is cleaned after each field use and is calibrated before each field use. At the time of calibration, all components of the explosimeter are checked for proper working order and are replaced as necessary. Batteries are checked before going into the field and before use and are replaced as necessary. The explosimeter is packed and handled to prevent damage.

5.8 CONDUCTIVITY METER

The conductivity meter and detector are transported in a protective foam-lined case. The cell is tested before going into the field using the test feature and is repaired by the manufacturer as necessary. The contact between the detector and the recorder must be kept clean and can be wiped, rinsed, or blown out. The detector is cleaned with distilled water rinses after each use.

5.9 pH METER

The electrode probe should be kept clean and stored in a protective plastic boot. The probe and meter are packed in a foam-padded case for transport. Prior to use, the batteries are checked by sliding the "batt chk" switch to the right and noting whether the dial moves to the green "batt chk" area. Extra 9-volt batteries will be on hand in the event the batteries do not check.

5.10 THERMOCOUPLE

The thermocouple is checked annually for accuracy. If erroneous readings are shown during calibration, or suspected while in the field, the thermocouple will be either repaired or replaced. No other preventive maintenance is required except for care during handling.

5.11 BAILERS

The bailers will be visually inspected to ensure that connections are not stripped and that there are no holes or dents. The operation of the check valve will be tested before going into the field and cleaned, repaired, or replaced as necessary.

6.0 FIELD ANALYTICAL PROCEDURES AND DATA REPORTING

6.1 CHEMICAL DATA

Sections 10.3 and 10.4 describe field chemical analysis and sampling for off-site analysis, respectively. Field chemical data, including pH, temperature, conductivity, HNU, and LEL readings, will be tabulated for presentation in the investigation report. Results of chemical analysis by Dames & Moore's subcontractor, UBTL, will be presented as received from the subcontractor. A typical report will include the method used for analysis of each parameter, units, and detection limits. Water and soil quality control reports will accompany the analytical results and will include data on percent recovery on spiked samples (10 percent), duplicate sample analysis (10 percent), and trip and field blank analysis.

6.2 HYDRAULIC DATA

A Falling Head or Instant Recharge test will be used during this phase of the investigation. It will be conducted on the upgradient well at Site 32 to determine the hydraulic conductivity of the surficial aquifer. It consists of injecting a known volume of water or "slug" of water into the boring or instrumentation and recording the rate at which the induced water level returns to the static water level. The amount of water to be injected is generally less than 50 gallons but is variable. Factors such as permeability of the formation depth to static water level, saturated formation thickness and boring diameter are considered to determine the amount required to achieve valid results.

6.3 SOIL BORING DATA

Soil boring data will be collected in the field by an experienced Dames & Moore geologist or soils specialist, as described in Section 8.2. During boring operations, lithologic descriptions and stratigraphic logs will be developed. Special emphasis will be placed on field identification of contaminated soils that are encountered. The edited Dames & Moore logs (Figure 8.1) will be included in the appendix of the report, and the significance of soil conditions relative to contaminant migration will be discussed on a site-by-site basis. If a correlation exists between borings, scaled cross sections may be drafted to illustrate these correlations.

6.4 SURVEYING DATA

Surveying data will be presented in the appendix of the report as received from the Dames & Moore surveying subcontractor. The data will include elevations and locations of all wells installed during the field effort using benchmarks traceable to USCGS or USGS survey markers, if available. Elevations of significant bodies of standing water and elevations and locations of preexisting wells will also be included. The survey data, in conjunction with water level measurements (Section 10.1), will be used to construct contour maps of the ground water surface. Individual figures will be drafted for each site showing the locations of monitoring wells, borings, sampling points, known pumping locations, and inferred direction of ground water flow.

7.0 SAMPLE NUMBERING SYSTEM

7.1 PROJECT IDENTIFICATION

The project shall be identified on sample labels as Eielson AFB with assigned Dames & Moore job number for the project.

7.2 SITE IDENTIFICATION

The sites shall be identified according to the following list:

1. S-1, Original Base Landfill, Site 1;

2. S-2, Old Base Landfill, Site 2;

3. S-3, Current Base Landfill, Site 3; and

4. S-32, Sewage Treatment Plan Spill Ponds, Site 32.

7.3 SEQUENCE NUMBER

Each sample shall be numbered sequentially as it is logged in the field in the master sample log.

7.4 SAMPLE DEPTH

Identification of soil samples shall include the depth interval (in feet from the ground surface) from which the sample was taken.

7.5 SPLIT SAMPLING

Soil split samples will be collected by vertically dividing each ASTM split spoon sample and placing each division into a separate sample container. Subsequent split spoon samples will be collected and divided in this same manner until adequate amounts of soil have been collected. As with water samples, all split soil samples will be identified using the standard numbering system.

7.6 SAMPLE TYPES AND EXAMPLES OF SAMPLE NUMBERS

7.6.1 Sample Type

The following abbreviations will be used to indicate sample type:

SW = Surface water

W = Ground water

SS = Surface sediment

B = Soil from boring

BW = Soil from well

7.6.2 Examples of Sample Numbers

Sample labels will contain the following information:

D&M Job Number

Location: Eielson AFB

Date

Time

Sampler's Initials

Sample Type

Sample Number

Purpose of Sample (Analyte and Sample Group)

Preservatives Used

The sample number consists of four to five fields. Field 1 indicates the sample type, as given in Section 7.5.1. Field 2 indicates the site, as numbered in Section 7.2. Field 3 will be lettered consecutively starting with A for each set of samples of a given type at a given site. Field 4 gives the depth from which the sample was obtained. This field applies

only to soil from borings and wells (sample types B and BW). Field 5 (field 4 for sample types SW, W, and SS) is the sequence number (see Section 7.3).

<u>Example 1: B 1-A, 0-1.5', 53</u>

Field 1:	B	The sample type is a soil from a boring
Field 2:	1	The sample is from Site 1, S-1, Original Base Landfill
Field 3:	A	This sample is from the first soil boring drilled at Site 1
Field 4:	0-1.5'	The sample was obtained from a depth of 0 to 1.5 feet
Field 5:	53	This was the 53rd sample to be logged in the master sample log

<u>Example 2: W 3-C, 63</u>

Field 1:	W	The sample type is a ground water sample
Field 2:	3	The sample is from Site 3, S-3, Current Base Landfill
Field 3:	C	The sample was obtained from the third well drilled at Site 3
Field 4:	63	This was the 63rd sample to be logged in the master sample log

7.7 BLANKS, SPIKES, AND DUPLICATES

Water sample field blanks, trip blanks, and duplicates will aggregate to an additional 10% of the sampling effort. Trip blanks will be prepared by UBTL, the Laboratory subcontractor, using field sample collection containers and double distilled/deionized water. The trip blanks will accompany sample bottles through the entire sample history. This type of blank permits a determination of the laboratory's cleaning procedures of sample containers; these bottles will remain sealed until opened for analysis. Field blanks will be prepared in the field with distilled water rinsed through the decontaminated bailer. This type of blank serves as a check on the field cleaning procedures.

Trip blanks and field blanks will be identified using the same numbering system as for standard samples to ensure that no preferential treatment is given to quality control samples. In general, quality control samples will be labeled as such only in the Dames & Moore master sample log and will be identified by their sequence number.

Field duplicate water sampling will also be conducted for quality control purposes. Duplicate samples will be collected by sequentially filling two sample bottles with water from a single sample collection. All duplicate water samples will receive identical treatment and will be identified using the same numbering system established for standard samples.

Laboratory spiked samples will be prepared and analyzed by UBTL for all chemical analyses performed. Laboratory duplicate analyses will also be performed. The laboratory spiked samples and laboratory duplicate samples will each comprise an additional 10% of individual sampling parameters. Results of laboratory spiked samples will be identified by UBTL and labeled with the standard sample numbering sequence, plus an additional identifier denoting that results reported are laboratory spike and duplicate analyses.

8.0 DRILLING AND INSTALLATION OF GROUND WATER MONITOR WELLS

8.1 DRILLING

The choice of drilling methods is influenced by two main factors: (1) the need to minimize the introduction of foreign material that may influence the results of chemical analyses; and (2) the need to penetrate diverse geologic materials.

All borings will be initiated using hollow-stem augers and will be extended by this method to auger refusal or to the required total depth. If difficulties are encountered such that this method proves ineffective, alternate methods will be proposed to the Technical Monitor for approval.

For ground water monitoring, wells will be augered to a maximum depth of 20 feet. Drilling locations and screening lengths for the eight additional wells to be installed in the Phase II, Stage 2 investigation have been detailed in Section II.

8.2 SOIL SAMPLING

Soil samples will be collected at 5-foot intervals during the drilling of borings in which monitor wells will be installed. At Site 1, the Old Base Landfill, soil samples will be obtained in four borings at the surface and at 2 1/2-, 5-, and 7 1/2-foot depth intervals. Samples will be obtained using an ASTM split spoon sampler driven 18 inches with a 140-pound hammer.

Each soil sample will be logged in the field by a Dames & Moore geologist or soils specialist. The standard Dames & Moore field drilling log is shown in Figure 8.1. Information recorded on this form includes sample descriptions using the Unified Soil Classification System, boring location, drilling and sampling method, sampling interval, and hammer blows per 6-inch advance of the split spoon.

Split spoon decontamination and sample shipping are discussed in Sections 11.1 and 12, respectively.

8.3 MONITOR WELL CONSTRUCTION AND COMPLETION

Monitor wells will be installed in accordance with USEPA Publication 330/9-51-002, NEIC Manual for Ground Water/Subsurface Investigations at

Dames & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
	DRILLING METHOD:		BORING NO.
			SHEET OF
	SAMPLING METHOD:		DRILLING
			START / FINISH
	WATER LEVEL		TIME / TIME
	TIME		
	DATE		DATE / DATE
DATUM / ELEVATION	CASING DEPTH		

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						9		
						0		

DRILLING CONTR.

No. 22107

BY DATE CHK'D BY

628.1 (3) (REV. 11-80)

FIGURE 8-1

DAMES & MOORE

FIELD LOG

Hazardous Waste Sites. The casing installed for the monitor wells will be a nominal 2-inch (2.375-inch O.D. by 2.067-inch I.D.) Schedule 40 PVC pipe and well screen. The screen is 0.010-inch slot size with a 0.25-inch space between slots. There are three parallel rows of horizontal slots factory-sawed along the length of each screen. All pipe and screen sections will be coupled with threaded joints; no PVC solvent or metal parts will be used. Each well will have enough screen installed (minimum of 10 feet) so that at least 2 feet of screen extends above the water table. Above the screen, blank casing will be installed to a nominal 2 to 3 feet above the ground surface.

After the casing is installed, the natural materials in the annular space will be allowed to collapse around the well screen if these materials are appropriate. If necessary, supplemental washed, rounded silica sand or gravel (with a grain size distribution compatible with the screen and soil formation) will be added to form a sand/gravel pack from the bottom of the borehole to 2 feet above the top of the screen. A 2- to 3-foot thick bentonite seal will be tremied above the sand/gravel pack. The bentonite will be checked to ensure that a complete seal exists.

The remainder of the annular space will be filled with a cement-bentonite mixture to about 1.5 feet from the ground surface. A concrete cap will be poured to the ground surface and form a 2-foot by 2-foot by 4-inch concrete pad at the surface. The installation will be completed by embedding a 5-foot length of 6-inch diameter steel pipe with a locking cap approximately 2.5 feet into the concrete cap and over the well pipe. Locks will be provided for all wells, and they will be keyed alike.

If the well is located in an area frequented by vehicular traffic, three 3-inch diameter steel guard posts will be installed radially from each wellhead. The guard posts will be 5 feet in total length and will be recessed 2 feet into the ground. The protective steel casing will be painted, and the well number will be marked on the steel casing exterior. Typical well construction is illustrated in Figure 8.2.

All boreholes will be monitored for organic vapors and explosive gases during drilling using an HNU photoionization meter and an explosimeter. Readings will be taken with both meters at the top of the borehole during drilling and immediately before sampling operations. The readings will be recorded in a field notebook.

Each soil sample will be tested with the HNU; readings will be recorded on the boring logs adjacent to the sample description.

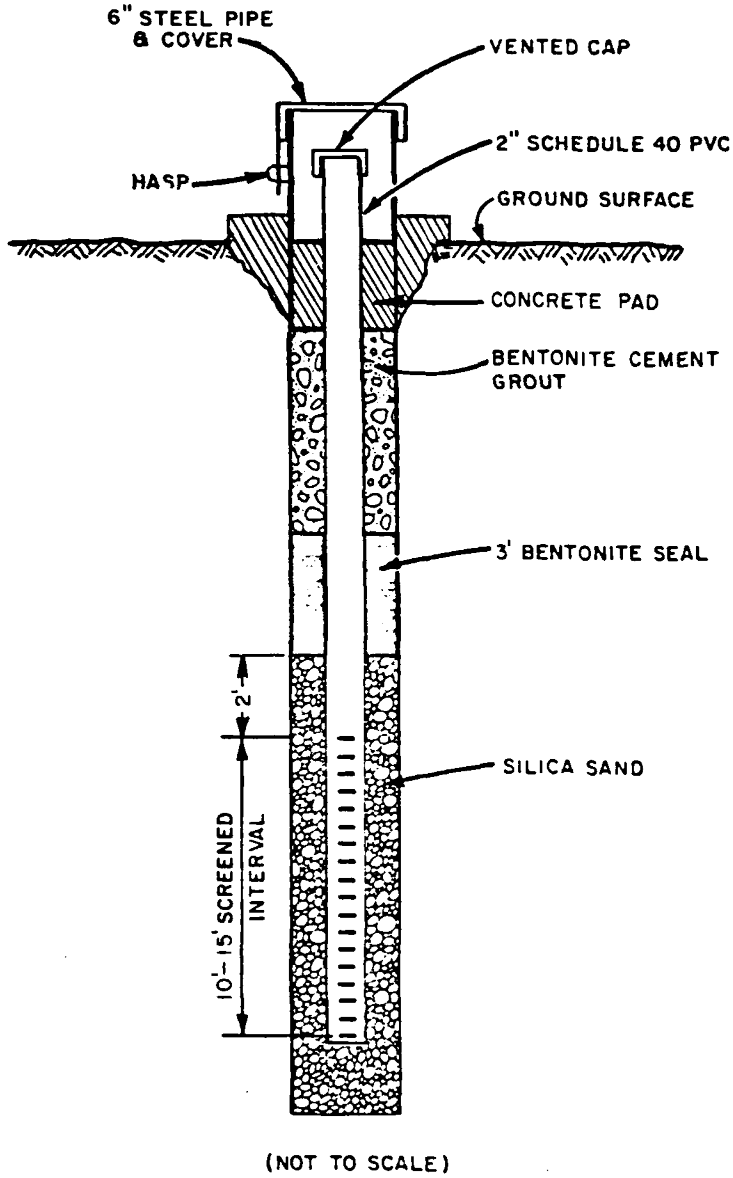


FIGURE 8-2
TYPICAL MONITOR WELL INSTALLATION

Dames & Moore

8.4 WELL DEVELOPMENT AND SAMPLING

All wells will be developed after completion to insure that relatively sediment-free water samples can be obtained. Prior to well completion, all well boreholes constructed with drilling mud will be flushed with potable water. The method of development will depend upon the equipment available. Air-lift pumping or the use of a submersible pump are the preferred methods for this project. It is anticipated that a Brainard-Kilman 1.7" hand pump will be used to develop the wells. After thorough decontamination of the assembly, the pump is inserted in the well. During the pumping process, water fills the annulus between the actuating pipe and the extension pipe to the point that it flows from the well head outlet. Volume of discharge water will be measured at this point. Pumping rates can be easily adjusted to formation conditions to avoid too rapid a rate of discharge and possible disturbance of the sand/gravel pack.

If air-lift pumping is used, the development procedure will consist of pumping air down the monitor well through a nominal 0.75-inch diameter flexible ABS pipe that extends to or near the bottom of the hole. Air will be supplied by a 125-cfm air compressor with valves to control the volume of air injected into the well. Water and gravel flow to the surface in the annulus between the 0.75-inch and 2-inch diameter pipes and can be discharged through a 2-inch elbow and extension pipe to the ground surface. Pumping and surging by alternately turning the air supply on and off is usually continued until the discharge water becomes clear or until it becomes obvious that further efforts are not going to improve the clarity of the water being discharged.

Each well will be allowed to stabilize after development for a minimum of 1 day before purging. Prior to sample collection, each well will be purged until a minimum of three casing vclumes of water have been removed. Purging will continue until pH, temperature, specific conductance, color, and odor of the discharge have stabilized, using the following criteria: pH, $\pm$0.1 standard unit; temperature, $\pm$0.5°C; specific conductance, $\pm$10 µmhos/cm.

Samples will be collected from the wells using a Teflon bottom discharge bailer. The bailer will be suspended in the well using a dedicated monofilament line and will be raised and lowered by hand. Prepared sampling containers with appropriate preservatives will be filled and immediately stored in insulated shipping containers.

If floating hydrocarbons are noted on the surface of the water table, the thickness of the hydrocarbon layer will be measured, and the floating hydrocarbons will be collected using a thief sampler.

At the end of each sampling day, the water samples will be shipped via air cargo to the testing laboratories (UBTL in Salt Lake City, Utah, and OEHL at Brooks AFB, Texas), where the samples will be received the following day. The soil samples will be stored in prewashed glass containers and frozen at the end of each working day. They will be shipped to the testing laboratories at the same time as the water samples are shipped.

8.5 GEOPHYSICAL LOGGING

No geophysical logging of the boreholes is anticipated during this field investigation.

8.6 BOREHOLE AND WELL ABANDONMENT

After consultation with the USAFOEHL and the Eielson POCs, and visual inspection and sounding of the Stage 1 wells, it will be determined whether any of the Stage 1 wells are damaged or inoperable. If so, a maximum of five wells will be abandoned as part of this investigation.

Boreholes (drilled solely for soil sampling) and damaged/inoperable wells will be abandoned by tremieing a lean bentonite-cement grout from the borehole/well bottom to the surface to ensure an adequate seal and preclude possible future migration of contaminants.

The locations of soil borings and abandoned wells will be marked in the field by means of labeled metal markers affixed in the cement grout. The locations of the soil borings and abandoned wells will be recorded on the project map for each specific site.

9.0 PUMP TEST

Pump tests, per se, will not be conducted during this investigation. A falling head or instant recharge test, as described in Section 6.2, will be employed to determine the hydraulic conductivity of the surficial aquifer.

10.0 GROUND WATER MONITORING AND SAMPLING

10.1 GROUND WATER LEVEL MEASUREMENT

The depth to ground water will be measured in each well from a reference notch cut in the PVC casing. This measurement will be made to the closest 0.01 foot using an electronic water level indicator or a ploper device. The distance from the top of the PVC to the ground surface will be recorded to the nearest 0.1 foot.

Water levels will be measured once each day on 3 consecutive days of the field effort in each well. These triplicate measurements will be useful for confirming that the wells have stabilized, or for recognizing the magnitude of short-term ground water fluctuations.

10.2 SURVEYING OF WELLS

In order to establish ground water flow patterns, two surveys will be made of all monitor wells and of key surface water elevations. The first survey, carried out before field operations commence, will be performed on Stage 1 wells and surface water elevations. A preliminary water table map will be constructed from these data. The second survey will encompass both Stage 1 and Stage 2 wells. The elevations of the top of the PVC will be measured to an accuracy of 0.01 foot, and horizontal locations will be accurate to 1.0 foot. The surveys will be tied to a reference datum point traceable to a USCGS or USGS survey marker. The final water table map will be based on data from both surveys to provide an accurate presentation of ground water flow patterns at the base.

10.3 ON-SITE ANALYSIS

Before water samples are collected for shipment to the laboratory, and after the wells have stabilized, a separate water sample from each well and surface water sampling location will be analyzed in the field for pH, conductivity, temperature, and color. Meters will be calibrated and maintained as described in Sections 4.0 and 5.0. The pH meter will be calibrated before each set of measurements using standard buffer solutions. Calibration of the thermometer and the conductivity meter will be checked in the laboratory before commencement of the field effort. All instrument probes will be rinsed with distilled water between measurements. The sample will be placed in a clean container against a white background when determining color. Since temperature can affect conductivity and pH readings, all measurements will be taken consecutively on the same sample.

Precautions will be taken to obtain a representative sample as described in Section 10.4.

Soil samples will be monitored in the field for organic vapors using an HNU photoionization meter. The readings will be taken immediately after opening the split spoon and will be recorded directly on the boring logs. The boreholes will be monitored with both the HNU and the explosimeter during drilling.

10.4 SAMPLING FOR OFF-SITE ANALYSIS

Ground water samples will be obtained from monitoring wells after proper well development (Section 8.4) using a Teflon bailer. Prior to sample collection, a stabilization test will be performed on each well to ensure that standing water in the well casing has been removed and that the sample will be representative of the aquifer. To perform the test, the well will be air-lift or hand pumped while monitoring the pH, temperature, and specific conductance of the discharge. When three successive readings (taken at intervals of one well volume) give equivalent values, the well is considered to have stabilized. Values are considered equivalent if they fall within the following ranges:

Specific conductance (temperature corrected): $\pm$ 10 μmhos/cm

pH: $\pm$ 0.1 pH unit

Temperature: $\pm$ 0.5°C

A form to be filled out during the stabilization test is given in Figure 10.1. The sample will be transferred directly from the bailer through the bottom-discharge device to the sample container supplied by the laboratory. Containers will be filled to capacity to minimize the loss of volatile constituents to the head space.

Subsurface soil samples will be obtained using standard split spoon methods, as described in Section VIII.B. After the sample has been logged, a stainless steel spoon will be used to transfer the sample to a glass sample jar with a Teflon-lined cap. As much of the sample as possible will be placed in the jar, but if the jar does not have the capacity, the greatest concentration of contamination, as indicated by visual examination or HNU readings, will be selectively collected.

Surface soil samples will be collected in a similar manner, using a stainless steel sampling spoon or spade.

Figure 10-1

STABILIZATION TEST

PARAMETER	WELL VOLUME EXTRACTED									
	1	2	3	4	5	6	7	8	9	10
Specific conductance (temperature corrected) ± 10 mhos/cm										
pH: ± 0.1 pH unit										
Temperature: ± 0.5°C										
Color										
Odor of Discharge										

11.0 DECONTAMINATION PROCEDURES

11.1 DRILLING, SOIL SAMPLING, AND MONITOR WELL INSTALLATION

Precautions will be taken not to introduce contaminants into the well during drilling and well installation. The rear end of the drill rig, augers, and rods will be steam cleaned between holes except in the case where the hole is moved only a short distance because of refusal on boulders.

Split spoon samplers will be decontaminated after each sample according to the following procedure:

1. Wash with laboratory-grade detergent, rinse with clean water;

2. Wash with methanol, rinse with distilled water; and

3. Air dry until the equipment is completely dry.

11.2 WELL DEVELOPMENT AND SLUG TESTS

Wells will be developed by air-lift or submersible pumping, as described in Section 8.4. Any part of the air-lift equipment or submersible pump that is placed down the hole will be decontaminated after developing each well using the procedure in Section 11.1. Teflon bailers will be decontaminated using the method for split spoons. A dedicated monofilament line will be used to lower the bailer in each well. The line will not be used in more than one well.

The same method of decontamination will be used for equipment used during stabilization tests.

11.3 WATER LEVEL MEASUREMENT

The probe used for water level measurements will be decontaminated between wells using the procedures described in Section 11.1.

11.4 WATER SAMPLING

Water samples will be obtained by bailing using a Teflon bailer suspended on a dedicated monofilament line as described in Section 10.4.

The bailer will be decontaminated as described in Section 11.1 after each sampling. The monofilament line will be discarded after use in one well.

11.5 SEDIMENT SAMPLING

Sediment sampling devices, including stainless steel spoons and spatulas, shall be decontaminated after collection of each sample using the same procedures as for split spoon samplers, described in Section 11.1.

11.6 SAMPLE HANDLING

Samples will be handled by personnel wearing nitrile gloves to avoid contamination. The sample containers will be well cushioned with packing materials when they are placed in the insulated cooling chests for transport to the laboratories. Care will be taken to seal bottle/vial caps tightly. Extra insurance against opening in transit will be provided by sealing the caps with filament tape for medium concentration samples.

11.7 PERSONNEL DECONTAMINATION

A personnel decontamination station shall be established at a location approved by base personnel. Persons working on the site shall report to the station for decontamination before leaving the base. In most instances, removal of protective clothing will suffice for decontamination. The station will have facilities for storage of reusable protective clothing and for the disposal of clothing contaminated beyond reuse. Also, facilities for decontaminating hands, boots, and gloves, consisting of detergent wash and tap water rinse, shall be provided. Facilities for sanitizing respirators using manufacturers' instructions shall be provided.

12.0 SAMPLE HANDLING AND PACKAGING

12.1 SPLIT SAMPLE PROCEDURES

In order for split sample analysis to be valid, the split sample must be as homogeneous as possible. Split spoon samples should be split vertically so that vertical stratification of contaminants will be equally distributed between the samples.

Split ground water samples will be collected at the same time using the same bailer. Half the bailer volume will be poured into each jar until the jars are full. Sample containers, preservatives, and handling will be identical for each member of the split sample.

12.2 SAMPLE CONTAINERS

Sample containers will be provided by UBTL. The containers will be either plastic or glass with Teflon-lined lids and will be pretreated with the preservatives listed in Table 12.1 (taken from Sabel and Clark, 1985).

12.3 SAMPLE HANDLING AND DECONTAMINATION

After collection in the field, all samples will be brought to an area adjacent to the personnel decontamination area for decontamination of sample containers. The sample containers will be handled with gloves until decontaminated with a detergent wash and tap water rinse if spills have occurred on the outside of the container. Care must be taken to avoid damaging the label during decontamination. The samples will be stored on ice and will be shipped to UBTL at the end of each day's sampling via overnight delivery. Shipping to OEHL will follow the POC's choosing 10 percent of the split samples for analysis by that laboratory.

12.4 PROCEDURES FOR PACKING LOW CONCENTRATION SAMPLES

Packing procedures will follow recommendations given in the USEPA manual, "Field Monitoring and Sampling of Hazardous Materials," Section 2, Part 5 (January 1983), as described for environmental samples, which are those samples obtained from upgradient and downgradient of the site (not at the actual site) and do not have any indications of gross contamination. These samples will be packaged as follows:

- Place the labeled and sealed sample container in a polyethylene bag and seal the bag;

- Place the sample in a metal or plastic picnic cooler containing a waterproof container of ice or an ice substitute and dividers to keep sample jars separated to minimize the possibility of breakage; and

- Seal the cooler with the latch and with packaging tape.

12.5 PROCEDURES FOR PACKING MEDIUM CONCENTRATION SAMPLES

Medium concentration samples will be packed in the same manner as described in Section 12.4 for low concentration samples. However, an effort will be made to identify, by visual examination in the field, any samples suspected of having elevated contaminant concentrations. These samples will be segregated and packed in a separate container, to the extent allowed by prevailing field conditions. Containers for these samples will be sealed with tape in addition to the normal processing used on all samples collected.

TABLE 12.1

SAMPLE HANDLING PROCEDURES

PARAMETER	CONTAINER[a]	PRESERVATIVE[b,l]	MAXIMUM HOLDING TIME[c]
Organic Tests[e]			
Purgeable halocarbons	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]	14 days
Purgeable aromatics	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]; HCl to pH ~ 2[j]	14 days
Acrolein and acrylonitrile	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]; adjust pH to 4-5[k]	14 days
Phenols	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]	7 days until extraction, 40 days after extraction
Benzidines	G, Teflon-lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]	7 days until extraction, 40 days after extraction
Phthalate esters	G, Teflon-lined cap	Cool, 4°C;	7 days until extraction, 40 days after extraction
Nitrosamines[g]	G, Teflon-lined cap	Cool, 4°C; store in dark; 0.008% $Na_2S_2O_3$[f]	7 days until extraction, 40 days after extraction
PCBs	G, Teflon-lined cap	Cool, 4°C; pH 5-9	7 days until extraction, 40 days after extraction
Nitroaromatics and isophorone	G, Teflon-lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction
Polynuclear aromatic hydrocarbons	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]; store in dark	7 days until extraction, 40 days after extraction

TABLE 12.1 (continued)

PARAMETER	CONTAINER[a]	PRESERVATIVE[b,l]	MAXIMUM HOLDING TIME[c]
Haloethers	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]	7 days until extraction, 40 days after extraction
Chlorinated hydrocarbons	G, Teflon-lined cap	Cool, 4°C	7 days until extraction, 40 days after extraction
TCDD	G, Teflon-lined cap	Cool, 4°C; 0.008% $Na_2S_2O_3$[f]	7 days until extraction, 40 days after extraction
<u>Pesticides Test</u>			
Pesticides	G, Teflon-lined septum	Cool, 4°C; pH 5-9[h]	7 days until extraction, 40 days after extraction
<u>Radiological Tests</u>			
Alpha, beta and radium	P, G	HNO_3 to pH ~ 2	6 months

[a] Polyethylene (P) or glass (G).

[b] Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

[c] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

TABLE 12.1 (continued)

[d] Samples should be filtered immediately on site before adding preservative for dissolved metals.

[e] Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds

[f] Should only be used in the presence of residual chlorine.

[g] For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[h] The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

[i] Maximum holding time is 24 hours when sulfide is present

[j] Sample receiving no pH adjustment must be analyzed within 7 days of sampling.

[k] Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

[l] When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of this section, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: hydrochloric acid (HCl) in water solutions at concentrations of 0.04% or less by weight (pH about 1.96 or greater); nitric acid (HNO_3) in water solutions at concentrations of 0.15% or less by weight (pH about 1.62 or greater); sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% or less by weight (pH about 1.15 or greater); and sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% or less by weight (pH about 12.30 or less).

Reference: Sabel and Clark, 1985.

13.0 SAMPLE CUSTODY AND DOCUMENTATION

13.1 SAMPLE IDENTIFICATION DOCUMENTS

Each sample shall be identified using the sample numbering system described in Section 7.0. A label on each sample container will contain the following information:

- Dames & Moore Job Number
- Location of Collection
- Time of Collection
- Date of Collection
- Sample Type
- Sampler's Initials
- Purpose of Sample
- Preservatives Used

At the end of each day's sampling effort, and before the samples are shipped to the analytical laboratory, this information will be recorded in the master sample log. Each sample will be assigned a unique sequence number, to be recorded both in the log and on the label, that will be used to identify the samples and to correlate with laboratory sample numbers assigned by UBTL.

13.2 CHAIN-OF CUSTODY RECORDS

A sample chain-of-custody form to be used during this investigation is illustrated in Figure 13-1. Chain-of-custody procedures will be followed so that the possession of a sample can be traced from the time of collection until the data are used in legal proceedings. One or more chain-of-custody forms will accompany each set of samples shipped from the site. Each time the custody of the samples is transferred, the form is signed by both the person relinquishing and the person receiving the samples. A copy of the form will be retained by the sampler, who will fill in the information on sample identity and who will also be the first person to relinquish the sample. If the sample containers appear to have been

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

Sample Source & Client						Field Personnel (Signature)
Project Title					Job No.	
Date	Time	Sample I.D. No.	Sample Type	No. of Containers	Sampling Site	Remarks

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

FIGURE 13-1
DAMES & MOORE
CHAIN-OF-CUSTODY RECORD

opened or tampered with, this should be noted by the person receiving the samples under the section entitled "Remarks."

13.3 FIELD LOG BOOKS

Each Dames & Moore professional shall maintain a personal field log book while on the site. Information recorded in the log book shall be written in an objective, factual manner so that persons reading the entries will be able to determine the sequence of events as they occurred in the field. If notes are made in the log book by someone other than the owner of the book, this should be indicated by the writer's signature and date. Information to be recorded in the field log book will include:

- Date and time of entry;
- Sample number;
- Sample description;
- Method of sampling;
- Location of sampling;
- Sketch of sample location;
- Field measurements such as pH, conductivity, HNU and temperature;
- Names and phone numbers of field contacts, drillers, and persons on site;
- Materials used in well construction; and
- Driller's standby and drilling time.

In addition to the above information, the following forms will be used to record detailed data:

- Dames & Moore Boring Log (Figure 8-1) - used in the field to record detailed sample descriptions and drilling methods;
- Field Memorandum (Figure 13-2) - used to outline daily activities for information of project manager and file records; and

FIELD MEMORANDUM

ACTION	INFO	
To:		File:
		X-Ref:
		Date:

From: Reply Required By:

Subject:

Reference(s):

FIGURE 13-2

DAMES & MOORE

FIELD MEMORANDUM

ROUTING

Dames & Moore

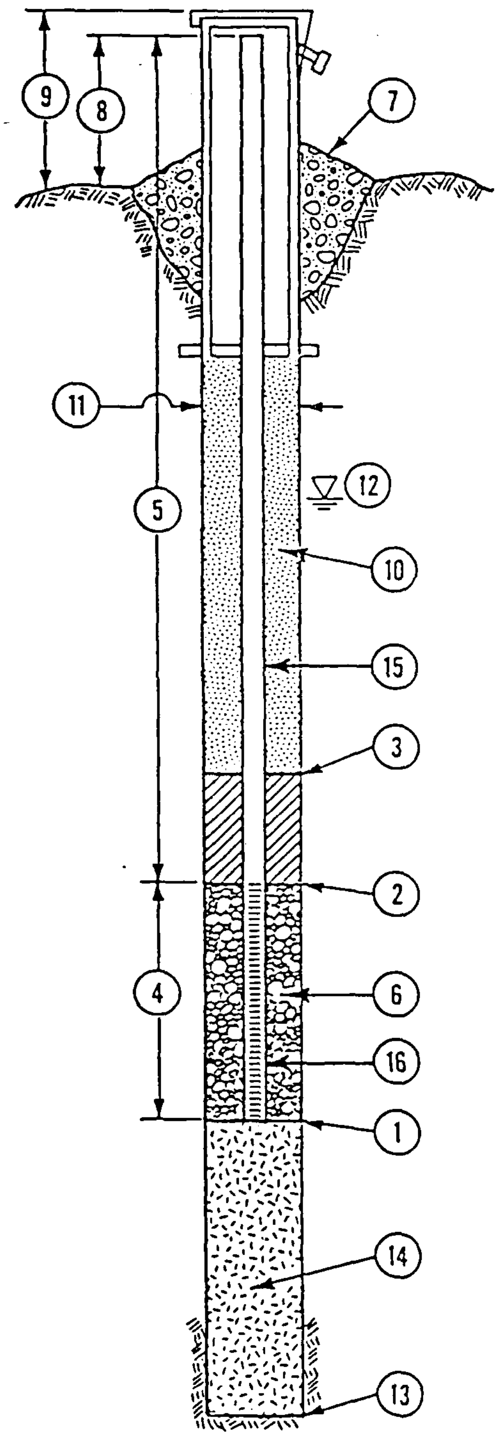
MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION ______________ JOB NUMBER ______________

TOP OF WELL CASING ELEVATION ______________ BORING NUMBER ______________

DATE ______________

LOCATION ______________



(1) DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE__________FEET.*

(2) DEPTH TO BOTTOM OF SEAL (IF INSTALLED) __________FEET.*

(3) DEPTH TO TOP OF SEAL (IF INSTALLED) __________FEET.*

(4) LENGTH OF WELL SCREEN__________FEET. SLOT SIZE__________.

(5) TOTAL LENGTH OF PIPE__________FEET AT ______INCH DIAMETER.

(6) TYPE OF PACK AROUND WELL POINT OR SLOTTED PIPE__________.

(7) CONCRETE CAP. YES NO (CIRCLE ONE)

(8) HEIGHT OF WELL CASING ABOVE GROUND __________FEET.

(9) PROTECTIVE CASING? YES NO (CIRCLE ONE)
HEIGHT ABOVE GROUND__________FEET.
LOCKING CAP? YES NO (CIRCLE ONE)

(10) TYPE OF UPPER BACKFILL__________.

(11) BOREHOLE DIAMETER__________INCHES.

(12) DEPTH TO GROUND WATER__________FEET.*

(13) TOTAL DEPTH OF BOREHOLE__________FEET.*

(14) TYPE OF LOWER BACKFILL__________.

(15) PIPE MATERIAL__________.

(16) SCREEN MATERIAL__________.

*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Dames & Moore

- Piezometer Detail Information Sheet (Figure 13-3) - used to record details of well installation.

Other forms are described in appropriate sections of this plan.

13.4 CORRECTIONS TO DOCUMENTATION

Any errors or mistakes in original field data shall be crossed out with a single line, and the person making the correction shall initial it. No data shall be erased.

In some circumstances, original documents may be transcribed, making appropriate changes and eliminating errors. In these cases, the successive documents shall be dated and numbered as sequential drafts.

13.5 TRAFFIC REPORTS

Knowledge of sample status will be maintained through review and evaluation of Dames & Moore field engineer reports, discussions with field personnel, and through contact with UBTL on a periodic basis. In this way, a working knowledge of sample traffic will be available through the project.

13.6 SHIPPING OF SAMPLES

Samples will be shipped at the end of each day's sampling efforts via overnight delivery to UBTL and/or OEHL. Sample packing procedures are given in Section 12.4.

14.0 SITE CLEANUP

A certain amount of trash will be generated from site investigation activities, including protective clothing, gloves, and cement bags. This material, assuming it has not been contaminated, will be disposed of in the proper locations (dumpsters, rubbish disposal areas) on site. Each site will be policed after completion of activities to ensure that no trash remains.

Soil wastes will be generated from drilling activities, but because drilling will not be conducted directly in the areas of dumping, it is expected that the soil will have only very low concentrations of contaminants. The soil from each hole will be monitored with the HNU and explosimeter. Any soil showing an organic vapor reading of less than 50 ppm and an LEL reading of less than 25 percent and having no unusual colors or odors will be considered uncontaminated and will be disposed of by spreading on site. Samples exceeding these criteria will be sealed in new 55-gallon drums. The same criteria will be used to determine if protective clothing has been contaminated. Any such contaminated clothing will be drummed along with the soil. The drums will become the property of the base, who will assume responsibility for their proper disposal.

15.0 FIELD TEAM ORGANIZATION AND RESPONSIBILITIES

15.1 ORGANIZATION

The Dames & Moore project organization for the Phase II Stage 2 investigation at Eielson AFB will be as follows:

- Project Director: Mr. George Nicholas, Partner
- Principal Investigator: Mr. Mike Ander, Associate
- Project Manager: Mr. John Flickinger, Senior Environmental Chemist
- Principal Staff Assistant: Ms. Carol Scholl, Staff Geologinst
- Field Manager: Mr. Mike Stanley
- Geophysical Investigations: Mr. Tom Jensen

A number of additional Dames & Moore staff level personnel will assist in field operations, data interpretation and report preparation as necessary.

15.2 RESPONSIBILITIES

Responsibilities for the individuals identified in Section 15.1 will be as follows:

- Project Director: Mr. George Nicholas -- Responsible for overall project direction and surveillance.
- Principal Investigator: Mr. Mike Ander -- The primary point of contact with OEHL and other Dames & Moore personnel, and the principal senior investigator responsible for project technical activities.
- Project Manager: Mr. John Flickinger -- Assistant to Mike Ander in project management and a secondary point of contact with OEHL. Responsible for technical oversight of all project chemistry activities during data collection and analysis.
- Principal Staff Assistant: Ms. Carol Scholl -- Assistant to Mssrs. Ander and Flickinger, in project management, coordination, and operation.

- Field Manager: Mr. Mike Stanley -- Responsible for organization and direction of field investigations. He will mobilize the field team, to include Dames & Moore assistant professionals or technicians and drilling and surveying subcontractors. He will stake locations of all sampling points and boring locations, review the site safety plan with site personnel, and monitor the initial drilling activities.

  In addition, he will be responsible for proper recording and transmittal of field records, and shipment of samples to UBTL for analysis.

- Geophysical Investigations: Mr. Tom Jenson -- Will conduct all site geophysical surveys and be responsible for all geophysical data interpretation and analysis.

15.3 TRAINING

15.3.1 Dames & Moore Personnel

The Dames & Moore personnel of staff level and above to be utilized on this job all have professional degrees in relevant fields, an previous experience in similar types of investigations. All field personnel will be thoroughly briefed on the appropriate safety measures specific to work on this project, and will have received safety training in accordance with Dames & Moore's firmwide Health and Safety Program.

15.3.2 Subcontractors

All site subcontractors will be thoroughly briefed on the following key aspects of project work:

- Project scope of work pertaining to the subcontractors anticipated role;
- Site Health and Safety considerations; and
- Timetable, cost, and other limitations pertinent to successful completion of the project within contractual scope.

Subcontractors selected will be experienced in related types of investigation, and have a demonstrated technical ability to complete their designated tasks.

16.0 SCHEDULE

Dames & Moore would be in a position to commence field work on this project within 3 weeks of receipt of the Work Order for Phase II, Stage 2. Figure 16-1 presents the milestone chart of the proposed schedule. The schedule assumes that drilling will commence immediately upon completion of the first survey and geophysical investigation. The project duration from time of receipt of the Work Order to submittal of the draft report is estimated to be 18 1/2 weeks, i.e., submittal of the first draft to USAFOEHL the week of November 16, 1986. It is anticipated that subsequent drafts will be submitted 4 weeks after receipt of review comments.

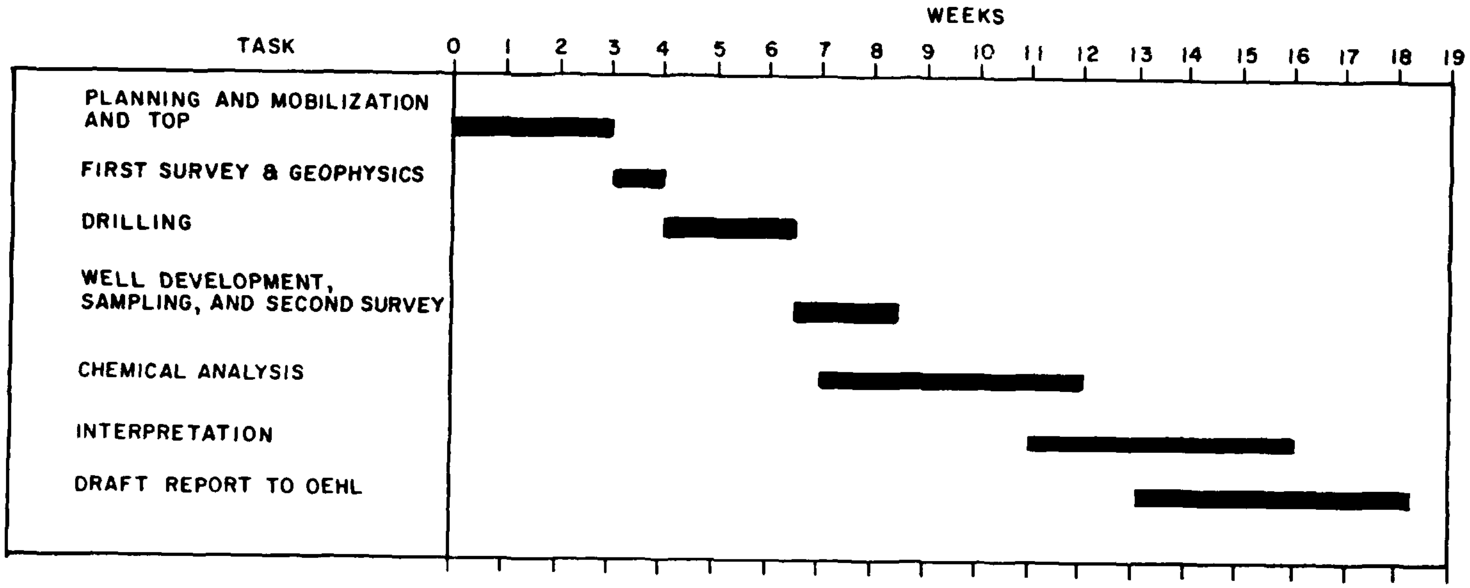


FIGURE 16-1

PROPOSED SCHEDULE FOR PHASE II STAGE 2
INVESTIGATION AT EIELSON AFB, ALASKA

Dames & Moore

17.0 REFERENCES

ADEC, 1983, Wells A and B Water Samples. Personal communication from Stan Justice, Environmental Engineer, to Carol D. Hughes, Col., Base Commander, 343 CSG; Eielson AFB, Alaska (June 30).

CH2M Hill, 1982, Installation Restoration Program Records Search for Eielson Air Force Base, Alaska (November).

Dames & Moore, 1986, Installation Restoration Program Phase II -- Confirmation/Quantification Stage 1 final Report (March 11).

Sabel, G.V., and Clark, T.P., 1985, Procedures for ground water monitoring: Minnesota Pollution Control Agency Guidelines. MPCA, Roseville (April).

U.S. Air Force, 1983, Drinking Water Treatment Not Meeting State Standards. Personal communication from John M. Clegg, Jr., Capt., USAF, BSC, Chief, Bioenvironmental Engineering, SGPB, Eielson AFB, Alaska, to 343 COMPW/CC, 343 CSG/CC, and 343 CSG/DE (April 25).

APPENDIX A

SITE SAFETY PLAN

SEE SECTION 3.2

APPENDIX B

STATEMENT OF WORK

4 JUN 1985

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION (STAGE 2)
Eielson Air Force Base, Alaska

I. DESCRIPTION OF WORK

The overall objective of the Phase II investigation is to define the magnitude, extent, direction and rate of movement of identified contaminants. A series of staged field investigations may be required to meet this objective.

During the initial survey (Stage 1) performed at Eielson AFB, four individual sites (Sites 3, 32, 2 and 1) were investigated, along with the Fuel Saturated Area. A limited number of monitoring wells and soil borings were emplaced, and soil and water samples were analyzed for general screening parameters (i.e., TOC, TOX, etc.).

This Stage 2 effort will build on the information previously gathered for Sites 3, 32, 2 and 1. The Fuel Saturated Area is being investigated as a Phase IV action and is not addressed in this effort. Additional wells and borings will be installed during this Stage 2 effort, and specific chemical analyses (i.e., Volatile Organics by gas chromatography, etc.) performed to identify any contamination present at Sites 3, 32, 2, or 1.

The purpose of this task is to undertake a field investigation at Eielson Air Force Base, Alaska: (1) to confirm the presence of suspected contamination within the specified areas of investigation; (2) to determine the magnitude of contamination and the potential for migration of those contaminants in the various environmental media; (3) identify public health and environmental hazards of migrating pollutants based on State or Federal standards for those contaminants; and (4) delineate additional investigations required beyond this stage to reach the Phase II objectives.

The Phase I and Phase II, Stage 1 IRP Reports (mailed under separate cover) incorporate the background, description and previous studies of all the sites for this task. To accomplish this survey effort, the contractor shall take the following actions:

A. Technical Operations Plan

Develop a Technical Operations Plan (TOP) based on the technical requirements specified in this task description for the proposed work effort. (See Sequence No. 19, Item VI below). This plan shall be explicit with regard to field procedures. The format for the TOP is provided under separate cover. The TOP shall be mailed to the USAFOEHL POC within two (2) weeks after Notice to Proceed for this delivery order.

B. Health and Safety

Comply with USAF, OSHA, EPA, state and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for

designating the appropriate levels of protection at study sites. Prepare a written Health and Safety Plan for the proposed work effort and coordinate it directly with applicable regulatory agencies prior to commencing field operations (i.e., drilling and sampling) as specified in Sequence No. 7, Item VI below). Provide an information copy of the Health and Safety Plan to the USAFOEHL after coordination with the regulatory agencies.

C. General Field Work

1. Installation of Groundwater Monitoring Wells

a. Monitor ambient air during all well drilling and soil boring work with a photoionization meter or equivalent organic vapor detector to identify the generation of potentially hazardous and/or toxic vapors or gases. Include air monitoring results in the boring logs.

b. Determine the exact location of all monitor wells and soil borings during the planning/mobilization phase of the field investigation. Consult with the Eielson AFB POC to minimize disruption of base activities, to properly position wells with respect to exact site locations, and to avoid underground utilities. Direct the drilling and sampling and maintain a detailed log of the conditions and materials penetrated during the course of the work.

c. Comply with the U.S. EPA Publication 330/9-S1-002, NEIC Manual for Ground Water/Subsurface Investigations at Hazard Waste Sites for monitoring well installation.

d. All well drilling, development, purging, and sampling methods must conform to State and other applicable regulatory agency requirements. Cite references in an appendix of the Report.

e. Install wells at a sufficient depth to collect samples representative of aquifer quality and to intercept contaminants if they are present.

f. Drill all monitoring wells using the following specifications:

(1) Drill all wells using techniques most appropriate for the geological formation underlying each site. If drilling fluid additives such as bentonite or polymers are used, ensure their components will not interfere with the chemical analyses to be performed on samples. Biodegradable organic drilling fluid additives are not permitted. Also, if an additive is used, split a sample of the additive. Analyze one part of the sample and send the other part to USAFOEHL/SA for analysis. Prior to well completion, flush all boreholes constructed with drilling mud by using drinking water.

(2) Take samples for stratigraphic control purposes at 5-foot intervals, where possible, and log them. Include pilot boring logs and well completion summaries in the Final Report (Sequence No. 4, Item VI, below).

(3) Drill a maximum of 8 wells. Total footage of all wells in this task shall not exceed 270 linear feet. Refer to the site specific details in Section ID.

(4) Construct each well with 2-inch inside diameter Schedule 40 PVC casing. Use threaded screw-type joints, glued fittings are not permitted. Screen each well using 2-inch diameter casing having up to 0.010 inch slots; use the same material as that of the casing. Cap the bottom of the screen. Flush thread all connections.

(5) Screen all wells so as to collect floating contaminants and to allow for yearly fluctuations of the water table. Screen all wells a minimum of 10 feet. A minimum of 8 feet of well screen should be below the groundwater table if feasible. High seasonal fluctuations in groundwater levels should be considered when designing the intervals of well screening needed.

g. Complete all monitoring wells using the following specifications:

(1) Once the casing is installed, allow the soil formation to collapse around the well screen, if appropriate. Where required, use a gravel pack of washed and bagged rounded silica sand or gravel with a grain size distribution compatible with the screen and soil formation. Place the pack from the bottom of the borehole to two feet above the top of the screen. Tremie a bentonite seal (two foot minimum) above the sand/gravel pack. Ensure the bentonite forms a complete seal. Grout the remainder of the annulus to the land surface with bentonite cement grout.

(2) Well surface completion will depend upon location. The Eielson AFB POC will determine which method is used at each well:

(a) If well stick-up is of concern in an area, complete the well flush with the land surface. Cut the casing two to three inches below land surface, and cement a protective locking lid in place. The protective lid shall consist of a cast-iron valve box assembly centered in a three foot diameter concrete pad sloped away from the valve box. Ensure that free drainage is maintained within the valve box. Also, provide a screw-type casing cap to prevent infiltration of surface water. Maintain a minimum of one foot clearance between the casing top and the bottom of the valve box. Clearly mark the well number on the valve box lid.

(b) If an above ground surface completion is used, extend the well casing two or three feet above land surface. Prove an end-plug or casing cap for each well. Shield the extended casing with a steel guard pipe which is placed over the casing and cap, and seated in a two-foot by two-foot by four-inch concrete surface pad. Slope the pad away from the well sleeve. Install a lockable cap or lid at the casing. Install three 3-inch diameter steel guard posts if Eielson AFB POC determines the well is in an area which needs such protection. The guard posts shall be five feet in

total length and installed radially from each wellhead. Recess the guard posts approximately two feet into the ground. Paint the protective steel sleeve and clearly number the well on the sleeve exterior.

Provide locks for all wells. Turn the lock keys over to the Eielson AFB POC following completion of the field work.

(3) Develop each well with a submersible pump, bailer, and/or airlift method. Continue well development until the discharge water is clear and free of sediment to the fullest extent possible.

(4) Determine by survey the elevation of all newly installed monitoring wells to an accuracy of 0.01 feet. Horizontally locate the new wells to an accuracy of 1.0 feet and record the position on both project and site specific maps. Use bench marks traceable to a USCGS or USGS survey marker if available.

(5) Measure water levels at all monitoring wells as feet below the ground surface or below the top of casing elevation to the nearest 0.01 feet. Report in terms of mean sea level. Measure static water levels in wells at the time of well development and prior to sampling.

2. Soil Borings

a. Install a maximum of 4 soil borings not to exceed a total of 40 linear feet. Accomplish the borings using hollow-stem auger techniques, if possible.

b. During the boring operations, develop lithographic descriptions and stratigraphic logs. Place special emphasis on field identification of contaminated soils encountered.

c. Scan all soil cores with a photoionization meter or equivalent organic vapor detector. Include monitoring results in the boring logs.

3. Borehole and Well Abandonment

a. Determine available techniques for well abandonment that are applicable to the type of monitoring wells installed and geological conditions at each well site. After consultation with the USAFOEHL and Eielson POCs, abandon any Stage 1 well that is damaged or inoperable. A maximum of five wells will be abandoned as part of this effort. Recommend the technique(s) appropriate to the future abandonment of all other monitoring wells (abandonment not part of this contract).

b. Tremie grout all boreholes and abandoned well to the surface with a bentonite grout. It is especially important to insure that they be adequately resealed to preclude future migration of contaminants.

c. Permanently mark each location where soil borings are drilled or wells were abandoned. Record the location on a project map for each specific site.

4. Well and Borehole Cleanup. Remove any well/borehole cuttings if requested by the Eielson POC and clean the general area following the completion of each well/borehole.

5. Sampling and Analysis

a. Strictly comply with the sampling techniques, maximum holding times, and preservation of samples as specified in the following references: Standard Methods for the Examination of Water and Wastewater, 16th Edition (1985), pages 37-44; ASTM, Section 11, Water and Environmental Technology; Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition (USEPA, 1984); and Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pages xiii to xix (1983). All chemical analyses (water and soil) shall meet the required limits of detection for the applicable EPA method identified in Attachment 1.

b. Allow wells to stabilize after development for a minimum of one day before sampling.

c. Sample wells during maximum groundwater flow conditions (late summer/early fall). Consider weather and hydrogeological parameters in the decision making process. As the first step of groundwater sampling operations at each well, take water level measurements to the nearest 0.01 foot with respect to an established surveyed point on top of the well casing. After measurements are taken, purge the well using a submersible pump. Purge until a minimum of three complete well volumes of water have been displaced and the pH, temperature, specific conductance, color, and odor of the discharge have stabilized, using the following criteria: pH ± 0.1 unit, temperature ± 0.5°C, specific conductance ± 10 μmhos. Include the final measurements in the results section of the draft and final reports

d. Collect well water samples with a Teflon bailer. During sample collection from all wells, examine the surface of the water table for the presence of hydrocarbons and, if applicable, measure the thickness of the hydrocarbon layer. If floating hydrocarbons are noted, use a "thief sampler" or similar device to collect the water sample.

e. If the well(s) cannot be sampled due to well development, well characteristics, or other reason(s), indicate the reason(s) in the report specified in Item VI below.

f. Split all water and soil samples. Analyze one set and immediately deliver the other set (the same collection day) to the base POC. The base POC will select 10% of the split samples, package the selections with appropriate forms, and deliver them to the contractor within 24 hours of receipt. Supply all packing and shipping materials to the base POC for packaging the split samples. Immediately ship (within 24 hours) the POC selected samples through overnight delivery to:

USAFOEHL/SA
Bldg 140
Brooks AFB TX 78235-5501

Include the following information with the samples sent to the USAFOEHL:

(1) Purpose of sample (analyte and sample group)

(2) Installation name (base)

(3) Sample number

(4) Source/location of sample

(5) Contract Task Numbers and Title of Project

(6) Method of collection (bailer, suction pump, air-lift pump, etc.)

(7) Volumes removed before sample taken

(8) Special Conditions (use of surrogate standard, special nonstandard preservations, etc.)

(9) Preservatives used

(10) Date and time collected

(11) Collector's name or initials

Forward this information with each sample by properly completing an AF Form 2752A "Environmental Sampling Data" and/or AF Form 2752B "Environmental Sampling Data - Trace Organics", working copies of which have been provided under separate cover. Label each sample container to reflect the data in (1), (2), (3), (4), (9), (10), and (11). In addition, copies of field logs documenting sample collection should accompany the samples.

Maintain chain-of-custody records for all samples, field blanks, and quality control samples.

g. Analyze an additional 10% of all samples, for each parameter, for field quality control purposes (field duplicates), as indicated in Attachment 1. Include all quality control procedures and data in draft and final reports. Duplicates shall be indistinguishable from other analytical samples so that the analytical personnel cannot determine which samples are duplicates.

h. For those methods which employ gas chromatography (GC) as the analytical technique (i.e., E602, SW8080, etc.) positive confirmation of identity is required for all analytes having concentrations higher than the

Method Detection Limit (MDL); confirm positive concentrations by second-column GC. Analytes which cannot be confirmed will be reported as "Not Detected" in the body of the report. Include the results of all second-column GC confirmational analyses in the report appendix along with other raw analytical data. Base the quantification of confirmed analytes upon the first-column analysis.

The maximum number of second-column confirmational analyses shall not exceed fifty percent (50%) of actual number of field samples (to include field QA/QC samples). The total number of samples for each GC method listed in Attachment 1 includes this allowance.

i. Analyze water and soil samples collected as specified in Section D for those parameters summarized in Attachment 3. The required detection limits and methods for these analyses are delineated in Attachment 1.

j. All chemical/physical analyses shall conform to state and other applicable federal and local regulatory agency legal requirements. If a regulatory agency requires that an analysis or analyses be performed in a certified laboratory, assure compliance with the requirement by furnishing documentation showing laboratory certification with the first analyses results to USAFOEHL/TS.

6. Decontamination Procedures

a. Decontaminate all sampling equipment prior to use and between samples to avoid cross contamination. Wash equipment with a laboratory-grade detergent followed by clean water, solvent (methanol) and distilled water rinses. Allow sufficient time for the solvent to evaporate and the equipment to dry completely.

b. Dedicate a monofilament line or steel wire used to lower bailers for each well; do not use a line in more than one well. The calibrated water level indicator for measuring well volume and fluid elevation must be decontaminated before use in each well.

c. Thoroughly clean and decontaminate the drilling rig and tools before initial use and after each borehole completion. As a minimum, steam clean drill bits after each borehole is installed. Drill from the "least" to the "most" contaminated areas, if possible.

7. Plot and map all field data collected for each site according to surveyed positions. Identify or estimate the nature of contamination and the magnitude and potential for contaminant flow within each site to receiving steams and groundwater.

8. Conduct a premobilization survey of all base sites. The purpose of the survey is to meet with base personnel, finalize the actual field techniques used in the effort, evaluate condition of Stage 1 wells and designate borehole and monitoring well locations. USAFOEHL representatives will accompany the contractor during the premobilization survey, if possible. Alaskan Air Command and regulatory agency representatives may also

accompany the contractor during the premobilization survey. The USAFOEHL Program Manager will notify the contractor not later than one week following the Notice to Proceed (NTP) of the exact number of personnel to accompany the contractor on the premobilization survey.

9. Any precious metals encountered on USAF installations during site investigations remain the property of the U.S. Air Force. Disclose the area of discovery to only the USAFOEHL program manager and the base commander. Discontinue work at the area of discovery until receiving guidance from the USAFOEHL. Work scheduled in other areas shall continue.

D. Specific Site Work

In addition to items delineated above, conduct the following specific actions at the sites listed below:

1. Site 3 - Current Landfill

a. Conduct an earth resistivity (ER) survey downgradient of the site to determine the areal extent of any contaminant plume.

b. Based upon the results of the ER survey, emplace one upgradient and two downgradient wells at the site. Each well is anticipated to be approximately 30 feet deep.

c. Obtain one groundwater sample from each well at the site, well W-2 (existing) and the three new wells. Analyze each sample (4 total) for volatile organics (E601 and 602), arsenic, cadmium, chromium, lead, mercury, silver, TDS and petroleum hydrocarbons.

2. Site 32 - Sewage Treatment Plant Spill Ponds

a. Conduct an ER survey downgradient of the site to determine the areal extent of any contaminant plume.

b. Based upon the results of the ER survey, emplace one upgradient and two downgradient wells at the site. Each well is anticipated to be approximately 30 feet deep.

c. Perform a slug test on the upgradient well to determine the hydraulic conductivity of the surficial aquifer.

d. Obtain one groundwater sample from each well at the site, well W-7 (existing) and the three new wells. Analyze each sample (4 total) for volatile organics (E601 and 602), lead, nitrates, TDS and petroleum hydrocarbons.

3. Site 2 - Old (1960-1967) Base Landfill

a. Emplace one monitoring well upgradient of the site and one well downgradient. The downgradient well shall be further downgradient than existing wells W-8 and W-9. Each well shall be approximately 30 feet deep.

b. Obtain one groundwater sample from each well at the site, wells W-8, W-9 and the two new wells.

c. Analyze each sample (4 total) for volatile organics (E601 and 602), lead, arsenic, cadmium, chromium, mercury, silver, TDS and petroleum hydrocarbons.

4. Site 1 - Old (1950-1960) Base Landfill

a. Resample well W-10. Analyze the sample for volatile organics (E601 and 602), pesticides (E608), lead, TDS and petroleum hydrocarbons.

b. Perform a soil boring program at the sites by installing four borings at compass points from 5 to 15 feet around well W-10. Each boring shall be approximately 7½ feet deep. Obtain soil samples at the surface and at 2½, 5 and 7½ feet from each boring. Analyze the samples (16 total) for pesticides (E608).

E. General Base Guidance

1. Be cognizant of and observe the AF base rules and regulations while working in the area.

2. A minimum of 7 days advance notice prior to arrival on base must be given to the Eielson AFB POC. Clearance must be granted prior to arrival at the base.

F. Data Review

1. Tabulate field and analytical laboratory results, including field and laboratory parameters and QA/QC data, and incorporate them into the next monthly R&D Status Reports to be forwarded to the USAFOEHL. In addition to the results, report the following: the time and dates for sample collection, extraction (if applicable) and analysis; the methods used and method detection limits achieved; a cross-reference for laboratory sample numbers and field sample numbers; a cross-reference of field sample numbers to sites; and include the chain-of-custody form for those sample data.

2. Upon completion of all analyses, tabulate and incorporate all results into an Informal Technical Information Report (Sequence No. 3, Item VI below) and forward the report to USAFOEHL for review prior to submission of the draft report.

3. Immediately report to the USAFOEHL Program Manager via telephone, data/results generated during this investigation which indicate a potential health risk (for example, a contaminated drinking water aquifer). Follow the telephone notification with a written notice and lab raw data (e.g., chromatograms, etc.) within three days.

G. Reporting

1. Prepare a draft report delineating all findings of this field investigation and forward it to the USAFOEHL (as specified in Sequence No. 4, Item VI below) for Air Force review and comment. Draft reports are considered "drafts" only in the sense that they have not been reviewed and approved by Air Force officials. In all other respects, "drafts" must be complete, in the proper format, and free of grammatical and typographical errors. Include a discussion of the regional/site specific hydrogeology, well and boring logs, data from water level surveys, aquifer tests, ER surveys, groundwater surface and gradient maps, water quality and soil analysis results, available geohydrologic cross sections, and laboratory and field QA/QC information. Follow the USAFOEHL supplied format (mailed under separate cover). The format is an integral part of this delivery order.

2. Results, conclusions and recommendations concerning the sites listed in this task which were produced in the technical report(s) of the previous staged work of IRP Phase II (mailed under separate cover), shall be used in the data reduction to plot any trends and arrive at the conclusions and recommendations of this effort's technical report (Sequence 4, Item VI below). The technical report of this effort shall be accomplished so that the report will reflect the combined up-to-date trend of each of the IRP Phase II sites listed herein.

3. In the results section, include water and soil analysis results, field quality control sample data, internal laboratory quality controlled data (lab blanks, lab spikes, and lab duplicates), and laboratory quality assurance information. Provide second column confirmation results and include which columns were used, the conditions existing, and retention times. Summarize the specific collection techniques, analytical method, holding time, and limit of detection for each analyte (Standard Methods, EPA, etc.) in the Appendix.

4. Make estimates of the magnitude, extent and direction which detected contaminants are moving. Identify potential environmental consequences of discovered contamination, where known, based upon State or Federal standards.

5. In the recommendation section, address each site and list them by category:

a. Category I consists of sites where no further action (including remedial action) is required. Data for these sites are considered sufficient to rule out unacceptable public health or environmental hazards.

b. Category II sites are those requiring additional Phase II effort to determine the direction, magnitude, rate of movement and extent of detected contaminants. Identify potential environmental consequences of discovered contamination, where known.

c. Category III sites are those that will require remedial actions (ready for IRP Phase IV). In the recommendations for Category III sites, include any possible influence on sites in Categories I and/or II due

to their connection with the same hydrological system. Clearly state any dependency between sites in different categories. Include a list of candidate remedial action alternatives, including Long Term Monitoring (LTM) as remedial action, and the corresponding rationale that should be considered in selecting the remedial action for a given site. List all alternatives that could potentially bring the site into compliance with environmental standards. For contaminants that do not have standards, EPA recommended safe levels for noncarcinogens (Health Advisory or Suggested-No-Adverse-Response Levels) and target levels for carcinogens (1×10^{-6} cancer risk level) may be used. Unless specifically requested, do not perform any cost analyses, including a cost/benefit review for remedial action alternatives. However, in those situations where field survey data indicate immediate corrective action is necessary, present specific, detailed recommendations.

For each category above, summarize the results of field data, environmental or regulatory criteria, or other pertinent information supporting conclusions and recommendations.

6. Provide cost estimates by line item for future efforts recommended for Category II sites and LTM Category III sites. Submit these estimates concurrently with the approved final technical report in a separately bound document. For Category II sites, develop detailed site-specific estimates using prioritized costing format (i.e., cost of conducting the required work on: the highest priority site only; the first two highest priority sites only; the first three highest priority sites only; etc., until all required work is discretely costed) for the proposed work effort. The Air Force determines the priority of sites by using contractor recommendations as a decision basis. Consider the type of contaminants, their magnitude, the direction and rate of their migration, and their subsequent potential for environmental and health consequences when prioritizing sites. For Category III sites slated for long-term monitoring, develop site-specific estimates which detail the costs associated with (1) permanent installation of monitoring wells; (2) groundwater sampling interface equipment, including permanent installations of pumps and sampling lines; and (3) four quarterly (1 year period) sample collections and laboratory chemical analyses of groundwater, etc. Only the cost requirement outlined in Sequence No. 2, Item VI, need be submitted.

H. Meetings

The contractor's project leader shall attend 2 meeting(s) to take place at a time to be specified by the USAFOEHL. Each meeting shall last for a duration of two eight hour days. Meeting locations are anticipated as follows:

1- Anchorage,
1- Eielson AFB.

II. SITE LOCATIONS AND DATES:

Eielson Air Force Base

Dates to be established.

III. BASE SUPPORT:

A. Prior to any contractor digging or drilling, locate underground utilities and issue digging permits.

B. Provide the contractor with existing engineering plans, drawings, diagrams, aerial photographs, etc., as needed to evaluate sites under investigation.

C. Provide escort into restricted areas.

D. Arrange for and have available prior to the start-up of field work, the following services, materials, work space, and items of equipment to support the contractor conducting the survey:

1. Personnel identification badges and vehicle passes and/or entry permits.

2. An area (preferably paved) where drilling equipment can be cleaned and decontaminated. A source of potable water (i.e., ordinary outdoor water faucet) and 110/115 VAC electrical outlet must be available within 25 feet of the area for steam cleaner hookup.

3. A temporary office area not to exceed 100 square feet equipped with a Class A telephone for local and long distance phone calls. Contractor shall pay for any long distance telephone calls made by his personnel from this phone.

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT:

1. USAFOEHL Program Manager
Ms Dee A. Sanders
USAFOEHL/TSS
Brooks AFB TX 78235-5501
(512) 536-2158
AUTOVON 240-2158/2159
1-800-821-4528

2. MAJCOM Monitor
Lt Col David A. Nuss
AAC/SGPB
Elmendorf AFB AK 99506-5000
(907) 552-4282
AUTOVON 317-552-4282

3. Eielson AFB Monitor

VI. In addition to sequence numbers 1, 5 and 11 listed in Attachment 1 to the contract, and which apply to all orders, the sequence numbers listed below are applicable to this order. Also shown are dates applicable to this order.

Sequence No.	Para No.	Block 10	Block 11	Block 12	Block 13	Block 14
19 (TOP)*	I.A	OTIME	86JUL15	86JUL29		15
7 (Health & Safety)	I.B	OTIME	86JUL15	86JUL29		3
3 (Prelim Data)	I.F.2	OTIME	***	***		3
4 (Tech. Rpt)	I.F.1	ONE/R	86NOV14	86NOV20	87FEB04	**
2 (Cost Est)	I.G.6	O/TIME	86NOV20	87FEB04		*****
14		Monthly	86JUL15	86AUG15	****	3
15		Monthly	86JUL15	86AUG15	****	3

*The Technical Operations Plans (TOP) required for this stage is due within 2 weeks of the Notice to Proceed (NTP).

**Two draft reports (25 copies of each) and one final report (50 copies plus the original camera ready copy) are required. Incorporate Air Force comments into the second draft and final reports as specified by the USAFOEHL. Supply the USAFOEHL with a copy of the first draft, second draft, and final reports for acceptance prior to distribution. Distribute remaining 24 copies of each draft report and 49 copies of the final report as specified by the USAFOEHL.

***Upon completion of the total analytical effort before submission of the first draft report.

****Submit monthly hereafter.

*****Submit with final report only.

Attachment 1

Analytical Methods, Detection Limits, and Number of Samples

Parameter[a]	Method[b] Extraction/ Analysis)	Detection Limit	No. of Samples	QC	Total Samples
Petroleum hydrocarbons	E418.1	100 µg/L	13	2	15
Volatile Organics	E601 & E602	c	13	2	23[e]
Pesticides	E608	c	1 (water)	1	3[e]
	SW3550/SW8080	c	16 (soil)	2	27[e]
Total Dissolved Solids (TDS)	E160.1	10 mg/L[d]	13	2	15
Nitrates	E353.1	0.01 mg/L(as N)	4	1	5
Lead	E239.2	0.005 mg/L[d]	13	2	15
Arsenic	E206.2	0.001 mg/L	8	1	9
Cadmium	E200.7	0.004 mg/L	8	1	9
Chromium	E200.7	0.007 mg/L	8	1	9
Mercury	E245.1	0.0002 mg/L	8	1	9
Silver	E200.7	0.007 mg/L	8	1	9

[a]Specific analytes for Volatile Organics and Pesticides are listed in Attachment 2.

[b]The methods cited in the analysis protocols come from the following sources:

"E" Methods (Water Only)

E100 through E500 Methods
Methods for Chemical Analysis of Water and Wastes, EPA Manual 600/4-79-020 (USEPA, 1983)

E600 Series Methods
Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater
USEPA
Federal Register, Vol 49, No 209, 26 Oct 1984

"SW" Methods (Water & Soils)

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd Edition (USEPA, 1984)

[c]Detection limits for all parameters analyzed by GC shall be as stated in the respective methods. Report results for organics in water as μg/l; in soil as mg/kg. Positive identification is required for all analytes having concentration higher than the method detection limit; confirm positive concentrations by second-column GC. Analytes which cannot be confirmed shall be reported as "Not Dectected" in the body of the report. Include the results of both first and second-column data in the appendix of the report. Base the quantification of confirmed analytes upon the first-column analysis.

[d]Report results as mg/L. Report no more than two significant figures for any concentrations.

[e]Total number of samples includes second-column confirmation on 50% of field samples (to include field QC samples).

Attachment 2

Volatile Organics - EPA Methods 601 and 602

Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chlorobenzene
Chloroethane
2-Chloroethylvinyl ether
Chloroform
Chloromethane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethyl benzene
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene (TCE)
Trichlorofluoromethane
Vinyl chloride

Pesticides - Methods E608 and SW8080

Aldrin
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Toxaphene
PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260

Attachment 3

Analyses by Site - Eielson AFS

	Water					Soil
Analyte	Site 3	Site 32	Site 2	Site 1		Site 1
Petroleum Hydrocarbons	4	4	4	1		
Volatile Organics	4	4	4	1		
Pesticides (E608)	--	--	--	1		
Pesticides (SW8080)						16
TDS	4	4	4	1		
Nitrates	--	4	--	--		
Lead	4	4	4	1		
Arsenic	4	--	4	--		
Cadmium	4	--	4	--		
Chromium	4	--	4	--		
Mercury	4	--	4	--		
Silver	4	--	4	--		

FILMED

7 8